# FARMERS DIGEST

JANUARY, 1946

Volume 9
Number 9

25c a Copy
$2.00 a Year

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# The Farmer's Digest


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The Farmers Digest

Published Monthly at Ambler, Pennsylvania

by the Farmer's Digest, Inc.

*25¢ a Copy*  *1 Year $2.00*

*2 Years $3.50*  *3 Years $5.00*

*Foreign and Canadian Subscriptions $2.50 a Year*

Entered as second-class matter at the Post Office at Ambler, Pa., May 5, 1937, under act of March 3, 1879

# The Farmer's Digest

Volume 9 January, 1946 Number 9


## Nitrogen to Increase Corn

Condensed from The Shorthorn World

ASSERTION that use of adequate amounts of commercial nitrogen to supplement current soil-fertility practices will return profitable increases in yield of corn—perhaps double the present average acre production — "comes almost as a bombshell among Midwest farmers who long have been told that commercial nitrogen does not pay," says Dr. Roger H. Bray, of the University of Illinois.

Yet, he says, a growing amount of evidence is being accumulated through research to show that commercial nitrogen, properly used, pays well. For instance, studies at Purdue University indicate that it takes two pounds of nitrogen, used in conjunction with the usual legume manure program, to produce a bushel of corn.

"As commercial nitrogen currently sells for about ten cents a pound, the additional cost for each bushel would be only 20 cents," Dr. Bay says. "The margin of profit obviously is considerable. Even at 50-cent corn, nitrogen probably can be used at a profit when supplementing good soil-fertility practices."

"The possibilities are tremendous," he says. "While hybrid corn meant an increase of 10 to 15 per cent in yields, this new soil fertility program might double even the high average yields of recent years on our better soils. Not all farmers may be able to climb this high, and not all seasons will supply enough water for such yields, but present yields are far below those that can be obtained with the usual rainfall."

Dr. Bray, who is chief in soil survey analysis at the Illinois College of Agriculture, points out that farmers on the rich prairie soils have not been fully aware of the need for nitrogen. They have been getting what they consider high yields without the use of commercial nitrogen.

He says experimental field results at the University of Illinois, for instance, show that the lime-

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and-legume program, supplemented by potash and phosphate in the required amounts, will bring corn yields up to an average of 96 bushels an acre in the dark soil areas.

"Nearly every year, however, individual farmers in the dark-soil areas of the Midwest cash in on corn yields that range up to 150 bushels per acre. The record for Illinois is 193 bushels. Neighbors have wished they could hit the corn-production jack-pot, Data indicate they can — furthermore through the use of commercial nitrogen they can do it at a profit." The Illinois scientist says that research indicates that 150-bushel yields are not freak occurrences. They are obtained usually in old pasture or feed lots where there is nitrogen in excess of that produced by legumes or ordinary amounts of manure. On the other hand, the phosphorus and acidity tests show that the available supplies of these two nutrients are no higher than on numerous other soils yielding far less.

Rainfall is the principal limiting factor to corn yields that cannot be controlled, but even in an average season it is sufficient for yields double, or more, the high county averages in recent years.

Discussing the supplemental use of commercial nitrogen, Dr. Bray says that "nitrogen, according to experimental evidence, is the only added cost. If there are adequate amounts of potash and phosphate for the 96-bushel yields, it is not necessary to increase these.

"Moisture and minerals may be made to stretch. Additional root vigor resulting from the nitrogen will enable the plant to obtain water, potash, and phosphate from a wider area. In fact, where the soil is in good physical condition, the added nitrogen will serve as a partial safeguard against deficiencies of these elements."

Commercial nitrogen promises to have value not only as a supplement to a good legume program, but as an emergency measure to provide fertility when a legume crop fails. The greater the yields the more foliage and stalks will be returned to the soil. These will in turn further improve its tilth, providing for still greater crop yields. High fertility has long been a first in erosion control. Plant fibres help prevent water from cutting away soil particles.

# Speedy Milker Washing

Condensed from Successful Farming

C. R. Elder
Iowa State College

WETTING agents are back. After two years in service with Uncle Sam's military forces, they are again appearing on the grocery shelves and in the farm milkhouses to help speed up the exasperating, time-consuming job of washing the milking machine.

This comparatively new method, made possible thru the use of these "soapless soaps," is so simple that a person trying it for the first time often feels that he is neglecting something. It's fast, easy, and most important—thoro.

Developed by A. W. Rudnick, extension dairyman at Iowa State College, under the practical conditions of a 32-cow dairy farm in northern Iowa, the method has spread over the entire United States. Requests for information on the process have come from such faraway places as New Zealand, Norway, and France.

Agricultural colleges in several states immediately started to investigate the idea. Several are now recommending wetting agents without reservation. Milk inspectors, at first skeptical that a milker could be washed clean without dismantling, are gradually placing their stamp of approval on the method.

There are hundreds of wetting agents now on the market, but only a few have any value as a cleaning agent. Some will be preferred to others by the dairyman. Among those which Professor Rudnick has used and found satisfactory in every way are Dreft, Swerl, and Vel, available from grocers, while M. P. 189, Nacconol, Orvus, and Arctic Syntex M. Beads are available to dairy plants in bulk.

Rudnick says that he has obtained the best results when he has used "straight" wetting agent, rather than those which contain other ingredients. Above all, he warns that products containing alkali do not rinse freely and are apt to form a deposit of milkstone or waterstone.

Wetting agents are effective as a cleaner of milk utensils partly because they reduce the surface tension of the washing solution. This causes rapid penetration, softens the milk film, and makes a better contact between the solution and the surface to be cleaned.

Milkstone, one of the big problems in keeping milk utensils

Reprinted by permission from Successful Farming, Des Moines, Iowa

bright and shining, usually disappears within a few weeks after wetting agents are used.

The washing of dairy equipment on many farms is often dreaded and as a result put off. The milk dries and is more difficult to remove. Without doubt, one of the reasons that the wetting agent has proved so successful as a cleaning agent is because it's nearly as easy to wash completely the equipment as it is to rinse with cold water and set aside for a more complete washing later in the day. Twice-a-day washing is so easy that most farmers using this method no longer give the machine a "lick and a promise" after the evening milking.

Rudnick says the older methods of washing the milking machine might well be compared to the days of the Saturday night bath. Many will remember when the tub was brought into the kitchen on Saturday. Water was heated in the wash boiler on the kitchen range; extra wood had to be chopped. And then after the weekly ablutions were completed, another half hour was consumed putting things back into place and cleaning up the kitchen. But the modern bathroom has changed all that.

And so it is when it comes to cleaning the dairy equipment. With the old method of washing, the machine was rinsed with cold water after the milking was completed. Then it was set aside until after breakfast, and probably until after the housewife got the youngsters off to school, the breakfast dishes done, and the chickens tended. Often the machine had to be carted to the house, where it was dismantled. It was washed, each part with a brush. There was no receptacle large enough in which to wash the pails, let alone a can. And after it was washed and scalded under such conditions, it still had to be carted back to the barn.

But the modern method has changed all that. Immediately after the last cow is milked, a full pail of warm water (130°-150°) containing a wetting agent is pumped thru the unit by means of the milking machine suction line. About a tablespoon of the wetting agent, or enough to produce a light suds, is used.

While the solution is being sucked into the milker bucket, the outside of the hose and the milker head are washed with a brush. When this operation is completed, the bucket is shaken so that all inside parts are thoroly covered. The solution is then poured back into the pail and is ready for the second milker unit. A pail of very hot water is then sucked thru the unit. The tubes are hung up to dry.

After the second unit has been cleaned, the suds are poured into a sink. The rubber seal is removed from the pail, washed, rinsed, and also hung up to dry. The pails are washed, rinsed on the outside, and placed on a utensil rack. The whole thing, including the milker units, extra pails, cans, and strainers, takes considerably less than 15 minutes. Some producers say they can wash two units easily in five minutes.

Since the milker is washed immediately after milking, no cold-water rinse is necessary before the wetting agent is drawn into the machine. No brushes are used in the tubes or inside of the pail.

Naturally the pulsator and the tubes should be examined to be doubly sure there are no obstructions that might interfere with the operation of the machine.

Of course there are skeptics of the plan. They say that it's impossible to obtain satisfactory bacteria counts when a milking machine is cared for in this fashion. But, as a matter of fact, Rudnick says that counts of 10,000 or less can be expected by the method.

LeRoy Brendeland, of Huxley, Iowa, has used the method for a year. Samples recently taken from his machine when a technician dropped in without advance warning, gave a count of 3,000 bacteria per cubic centimeter. Since counts of 50,000 are acceptable for production of Grade A raw milk, it can be easily seen that Mr. Brendeland is doing a mighty good job of cleaning.

Before milking, Brendeland uses a clear, cold-water rinse. Even better results might be obtained if he used a chlorine solution before milking instead of the clear water.

The producer must understand, however, that chlorine will not sterilize unless the dairy equipment is first washed thoroly. Rudnick warns that the directions of the manufacturer should be followed carefully since the solution must be strong enough to do a job of sterilizing, but not so strong as to cause corrosion of the metal parts. While the use of a chlorine solution does give added protection, it tends to cause the rubber parts to check. Since satisfactory counts can be obtained without chlorine, he questions whether it is advisable to use it on the tubes.

On five different Iowa farms where all hot water had to be heated in the house, counts under 20,000 were easily obtainable with the method. Most observations ran under 10,000 and over half of them were under 5,000.

Considerable experimental work has been done at Michigan State College to determine the effectiveness of the newer types of wash-

ing materials and the washing procedures. Over a period of four months, under the direction of J. M. Jensen, dairy specialist, a comparison was made between standard washing methods and "flush" washing on six milkers at the Michigan State College dairy barns. Results effectively demonstrated that at least as good results can be obtained with the wetting agents as with standard washing practices. In both instances, rinse counts ranged from 250 to 1,000 per cubic centimeter.

Professor Jensen reports that a study involving more than 30 Michigan milk producers bears out the conclusion that wetting agents will do the job. He has also come to the conclusion that the effectiveness of cleaning is dependent, to a great extent, upon the amount of water used, the kind of wetting agent, and the intelligent use of the materials.

The production of clean milk involves careful handling thruout the entire process from the cow to the consumer. And carelessness at any stage of the process can easily undo all the precautions that might be taken with the milking machine.

One of Pendleton's tests in Massachusetts is particularly interesting. He had a farmer wash his two-unit milker for two weeks, using wetting agents. In the washing of one of the units, the producer first flushed the milker with cold water, then with the wetting solution, followed by the recommended hot water rinse. The initial cold-water rinse was eliminated from the second unit. The average of the bacteria counts on the two units over the period was very similar—13,000 for the unit receiving the initial cold water rinse and 12,000 for the unit in which only suds and hot water rinse were used.

After the two weeks period, he had the farmer return to his old method of brush-washing the machine. Amazingly enough, the average bacteria count for the next two weeks period was well over twice as great.

As an added innovation, he had the farmer merely draw cold water thru the machine after the evening milking, which is the custom, it seems, on many dairy farms. The bacteria count jumped to 143,000—a pretty good argument for twice-a-day washing.

Everyone must agree that clean, wholesome milk is the only kind worthy of the good repute generally given to milk. Clean, wholesome milk must not be sacrificed for short cuts. However, when procedures are found that do not injure quality, but make more sanitary milk production possible with less drudgery, they certainly should be encouraged.

# Sunshine for Sale

**Condensed from Farm Journal**

SUNSHINE makes plants grow—farmers have known that since the dawn of agriculture—but we are just discovering that it does far more than that.

Certain foods that are full of sunlight have more food value, more energy, more health, than those raised in cloudy areas or in cloudy seasons.

Farmers can't control the amount of sunlight they get, but they can capitalize on it, and advertise it, if they get it. Sunshine may be something you can sell. It may some day affect the price of land. It may aid one region in competing with another for the consumer's dollar.

Much of the eastern U. S. has only 60 to 70% of the possible sunshine it could have in summer, whereas most of the rest of the country has 70 to 80%, and California's Imperial Valley over 90%.

Effect of the sun has now been proved on tomatoes, turnip greens, apples, oranges, hay, and milk, and no one knows how many other crops may likewise be affected.

Experiments have recently been completed by Dr. Karl C. Hamner and Dr. G. F. Somers at the U. S. Plant, Soil and Nutrition Laboratory at Cornell University.

Out behind the laboratory is the strangest tomato patch I have ever seen. Hundreds of plants are growing in individual jars, in sand wet with chemical solutions. Some have grown in the shade all their lives, others in full sun. Some are shrouded in white cloth, with only the fruit exposed; on others the tomatoes are covered and the plants exposed. In the midst of them stand a complicated device, which measures electrically the intensity of the light each day.

Similar experiments are in full swing under ordinary field conditions.

Here is what the experiments show:

The amount of Vitamin C depends directly on the amount of sunlight the tomatoes get for two or three weeks before picking. By varying the light (under artificial conditions indoors) the Vitamin C in tomatoes can be increased almost 100%. In turnip greens the C can be boosted 800%!

It's the sunlight acting on the tomato itself — not on the vine — that makes the difference. (Whether the light does the same

**Reprinted by permission from the Farm Journal, Philadelphia, Penna., Nov., 1945**

thing to a picked tomato, ripening on the kitchen window-sill, is being tested as this is written.)

Think what this means. Tomatoes are one of our most important sources of Vitamin C. They are so cheap that everyone can have them.

The diets of most people are more lacking in riboflavin (one of the B vitamins) and in C than in other vitamins, says Dr. L. A. Maynard, head of the U. S. laboratory just mentioned. Incidentally, the only three animals that need to eat C are man, monkeys and guinea pigs. All of the others make their own.

The basic thing that C does for us is to help maintain the structure of the capillaries. Without enough of it we develop internal hemorrhages, which in turn lead to all manner of troubles. Also we get scurvy.

Most human beings need 25 to 30 milligrams of C per day to prevent scurvy. Scientists aren't sure what it takes to give us maximum health—it varies by individuals—but they consider 70 milligrams probably enough.

Some tomatoes of average size contain only 20 milligrams of C, others the same size have 90. If we got no C elsewhere this would mean the difference between eating one tomato a day or three.

Variety of the tomato has something to do with the C content, but sunlight is the big factor. The soil makes no appreciable difference.

To prove it, Hammer and Somers checked on tomatoes grown in Calfornia, several parts of the South, Wyoming, Wisconsin and New York. They varied widely in amount of C. Then the scientists brought soil from each of these fields to Cornell and grew the same kinds of tomatoes there. Under the same sunshine all difference vanished.

As already mentioned, sunlight has the same effect on certain other crops. The side of an apple facing the sun actually has more C than the shady side. (Moral: if you eat only half an apple be sure to eat the red side.) Oranges on the inside of the tree have less C than those on the outside.

How the sunlight makes the vitamin the scientists don't know. Nor do they know why a tomato has vitamin C anyway. It doesn't store any reserve of it in the seeds. What does it need it for? If the Cornell experiment can answer these questions they will tell us some basic things about plants that are still secrets.

Does sunlight increase other food values than vitamin C?

It certainly does. When it shines on a cow's skin it puts more vitamin D (the bone-builder) into the milk.

Sunlight on cut hay steps up

the D in the forage the cow eats. Curiously, it has no such effect on hay before it is cut. When a farmer dries uncured hay in his mow or in a dehydrator he gains some vitamin A by harvesting more leaves, but he loses D. Dr. Maynard points out that this is a good trade, because cattle need D only when they are young, whereas they need A throughout life. A farmer can make a little hay the old way for his calves, or feed them cod liver oil, and get the D that way.

On a sunny day hay also contains more carbohydrate than when the weather is cloudy. Can it store this up, from day to day? Many plant scientists think so. Some farmers do, too. They often complain that the hay made in a cloudy, wet summer doesn't seem to "feed out well."

Maybe sunlight affects other vitamins than C and D—carotene (A), niacin (B), and thiamine (B), for instance. No one can say for sure, but Dr. Maynard says it's "quite possible," and Dr. Hamner reports that "it looks promising."

This sunlight business is obviously something for farmers—and consumers—to keep track of.

## Less Cob—More Corn

Farmers who apply adequate plant food in their form of nitrogen, phosphorus, and potassium —and calcium where needed, to their soils to increase yields have an additional incentive in the case of corn. It has been established that cobs make up a much smaller proportion, and grain a much larger percentage, of the crop when grown on properly fertilized and well-handled land.

Prof. H. J. Snider, assistant chief in soil experimental fields, University of Illinois College of Agriculture, says this reduction is desirable because cobs have little or no value as feed for livestock or as nutrient for plants.

He reports that corn grown at the Ewing, Ill., Experimental Field on properly fertilized land contained 15 per cent or 10.5 pounds of cobs per 70-pound bushel of ear-corn. The same hybrid, U. S. 13, from untreated land on this field contained 20 per cent or 14 pounds of cobs per bushel of ear-corn. He adds:

"This means that each 100 bushels of ear-corn grown on this land contained 350 pounds more cobs than 100 bushels of the same hybrid grown on treated land."

On this basis, he points out, a farmer who doesn't fertilize, short-changes himself by 5 bushels of grain in each 100 bushels of corn produced.

—*Texas Farming & Citriculture*

# Soil Fertility and Trace Elements

Condensed from Soil Conservation

*W. A. Roach*

East Malling Research Station, Kent, England

WHEN Britain was faced with a shortage of shipping, she met in consequence not only a reduction of imported food but also of the mineral fertilizers so urgently needed to increase food production. The urgent need for increased food crops led to the utilization of land that in peacetime had been considered unfit for cultivation. Many special problems in plant nutrition therefore arose and a concerted attack was launched by the Agricultural Research Council acting in association with the Agricultural Improvement Council for England and Wales. Special attention was given to the detection and cure of mineral deficiencies and excesses in plants.

The importance of the major nutrients (nitrogen, phosphorus, potash and lime) had been fully realized following the work of Lawes and Gilbert a century ago; and a huge mineral fertilizer industry has grown up to supply the crops' requirements of these major nutrients. Magnesium has been known to be a constituent of chlorophyll, the all-important green coloring matter of plants, for a long time, and serious attention has been paid to the possibility of shortages of this element. The degree of importance of the trace elements, however, has not been realized until quite recently.

*Diagnosis of Mineral Deficiencies.* Professor Wallace, the director of Britain's Long Ashton Research Station, laid the foundation for the diagnosis of mineral deficiencies by the study of symptoms over twenty years ago. He grew plants in conditions which provided all necessary nutrients with some one major exception and studied the leaf symptoms resulting. These symptoms he used for diagnosing mineral deficiencies in the field. This symptom-description work has been taken up all over the world and applied to many agricultural plants, especially in America.

When symptoms are distinct and easily recognizable there is little need for other methods than this, but for many obscure cases other methods must be used. For this purpose, I started work on plant analysis and injection, mainly for fruit, over fifteen years ago; it was extended to primary food crops early in the world war.

Analysis reveals what is ab-

Reprinted by permission from Soil Conservation, Washington, D. C., Oct., 1945

sorbed from the soil, and deficiencies may often be diagnosed on the basis of analysis alone, but this is by no means always possible. Because of the number of elements and of the minute amount of the trace elements, special chemical methods must be employed.

The widely used spectroscopic method is based on the fact that when a chemical element is heated to a very high temperature, it emits light of a characteristic color. In the spectograph such colors are separated and photographed as lines. The elements may be identified by the position of the lines, and their amounts may be determined from the densities of the lines.

Because of the difficulty of obtaining samples quite free from surface contamination by dust, spray or rain splashes I devised a method in which samples of only 0.025 g. of dry leaf material are needed. These are burnt in an oxyacetylene flame.

*Plant Injection.* The minimum requirement of each plant type for each nutrient must first be determined on healthy material and whenever a sample contains less than this amount a deficiency can be diagnosed on the basis of analysis alone. Trace elements, especially iron, frequently occur in the plant in a form which it cannot use; and, paradoxically, plants containing abnormally large amounts of iron frequently respond to the addition of more in a suitable form. This commonly happens in the presence of abnormally large amounts of calcium, the condition consequently being known as lime-induced chlorosis; and an excess of this element may be taken as an indication that one or more trace elements may be in an unsuitable form. For a definite diagnosis another method, e.g., plant injection, must be used.

Diagnostic injection consists in introducing solutions of the nutrients or mixtures each into a selected part of a plant and watching the effect by comparison with similar untreated parts of the plant. It is based on a number of fortunate facts: first, when a plant is cut, far from bleeding like an animal, it usually absorbs any watery liquid bathing the cut. If in the liquid colored dye is dissolved, its path in the plant may be traced visually. Instead of being pumped round the whole organism as in an animal, it travels limited distances along definite conducting tissues and is distributed thence into the leaf blade.

The mode and extent of travel depends on the size and position of the cut and varies from one plant species to another. A score or so of plants have so far been studied and for most of these it is

possible to treat, or inject, at will, almost any part of the plant, from a tiny area between two neighboring veins of a leaf to a whole branch or even a whole tree. Most fortunately for the present purpose, substances introduced in this artificial manner produce similar effects to those resulting from ordinary absorption.

In the most commonly used method nutrients are introduced one or more at a time into one half of a leaf and the effect is seen, sometimes in two or three days, but more usually in a week or two, by comparison with the untreated half. The effect is revealed as either an improvement in color or "complexion," or increase in area or thickness and sometimes in all three respects.

*Spraying Solutions.* A further simple and quick method of diagnosis of trace elements and deficiencies which can be applied by technical officers and farmers and which works especially well for manganese and boron deficiencies, consists in spraying solutions containing the deficient minerals such as manganese sulphate and boric acid on the foliage of fairly young plants. An ordinary watering can fitted with a nozzle, may be used for field crops.

In practice 1 ounce of the mineral compound is dissolved in 5 gallons of water and sprayed over an area of 30 square yards.

Advisory officers and practical men have been quick to take advantage of all these methods.

*Increased Potato Tonnage.* The total failure of the potato crop over wide areas of ploughed up derelict lands in the west of England were proved by injection and analysis to be due to deficiencies of calcium and, to a less extent, magnesium. A waste product was used to make good the deficiency, and as a result there was an increase of some 3,000 tons of potatoes in 1943.

The same two methods revealed that the cause of a most devastating trouble in cherries, which had puzzled experts for 30 years, was a deficiency of manganese. This has been made good by introducing small pellets of manganese sulphate into holes drilled in the trunk; and trees that have been barren for years have produced a few months later heavy crops. This rapidity of action of injected substances enables cures to be effected in trees while more slow acting remedial treatments are supplied to the soil.

These are instances of the kind of work that is being done to help in the great task of feeding the large population of Britain's small islands and which we hope will contribute to the prosperity of all countries in the days of peace.

# Let's Examine Crop Rotations

**Condensed from Farm Science Reporter**

*W. H. Pierre and G. M. Browning*

We have been so involved in producing the crops the government has asked for to help win the war that we are in danger of losing sight of the need of growing good rotations for maintaining fertility and producing high yields per acre.

Iowa farmers are now growing nearly a third more acres of corn and soybeans than they did in 1941—the combined acreage of these two crops is nearly 3½ million acres more than it was in 1941. With this increase in the acreage of row crops has come a decrease in the soil conserving crops—the hay and pasture.

Though this change has been necessary, it is time now to check up on just what the change means. We need to get ourselves ready for a "right face" or a "left face" if not an "about face" in our cropping system.

How much has this change in our cropping system increased soil depletion on Iowa farms? The rate of depletion has been over one-half faster since 1941 than before, a careful study shows.

The growing of intertilled crops such as corn and soybeans not only uses plant food much faster, but the loss from erosion is greater, too, on rolling land. On the other hand, legume sod crops add organic matter to the soil which following crops can use, and legumes greatly reduce soil erosion. So when we grow fewer acres of these soil conserving crops and put into their place crops that rapidly take away plant food and increase erosion, it's easy to see why our soil fertility has gone down rapidly since 1941.

The first and most important requirement of a good crop rotation is that it contains plenty of legumes. Sod crops of legume-grass combination produce much feed per acre and, in addition, they do these things:

1. Increase the yields of other crops in the rotation.
2. Help maintain soil fertility, particularly the nitrogen and organic matter.
3. Produce good soil tilth.
4. Help control erosion.

The number of years the land should be kept in meadow or pasture during the rotation varies with the kind of soil and the steepness of the slopes. The less

Reprinted from Farm Science Reporter, Ames, Iowa, July, 1945

the organic matter content of soils or the steeper the slope the larger should be the proportion of soil conserving crops in the rotation. In all cases, however, the legume crop is the first requirement or "core" of the rotation.

How much can you expect legumes in the rotation to increase the yield corn? You can get a partial answer to this from two experiments at our Experimental Farm in Page County. In one of these experiments corn has been grown continuously for 13 years on the same plots, while plots beside them were in a 3-year rotation of corn, oats and red clover.

During the 13 years the corn grown continuously on the same land averaged 31.8 bushels per acre, while that grown in a 3-year rotation averaged 54.0 bushels — an increase of over 22 bushels an acre for rotation. Moreover, the difference in yield between the two treatments is rapidly getting greater. In the last 5 years (1940-44) the corn grown in the rotation averaged 71.2 bushels per acre while that grown continuously averaged only 23.9 bushels per acre.

In another experiment using three different rotations, the most striking result was the large benefit obtained from sweetclover. Where sweetclover was grown in oats and turned under the following spring for corn, the yield of corn was increased an average of 26 bushels per acre. This shows the marked benefit that would be obtained each year in the yield of corn if all the small grain in Iowa were seeded down to a legume or legume-grass mixture.

Where corn was grown in a 4-year rotation of corn, oats, followed by clover and timothy for 2 years, the yield of corn was 32 bushels higher than when grown in a corn-oats rotation. In poor crop years the differences in yield may be smaller than those obtained in the good crop years of 1942-1944. However, the differences between the poor and good rotations will probably become greater the longer the treatments are continued.

One of the most important reasons why crop yields decrease when land is kept in grain crops such as corn and oats is that these crops lower the nitrogen and organic matter content of soils. Nitrogen is needed by plants in large quantities. With too little nitrogen, plants turn pale green and make spindly growth.

When legumes are brought into the rotation the crop following has a dark green color, an indication that it is getting plenty of nitrogen. Inoculated legumes do not depend on the soil for nitrogen, but absorb it from the air

through the nodule bacteria on their roots. Both the roots and tops of legumes contain large amounts of nitrogen taken from the air. When these are plowed under, both nitrogen and organic matter are added to the soil.

At the Agronomy Farm at Ames we have studied the loss of organic matter from soils cropped differently for a period of 20 years. We found that where corn was grown continuously on Clarion loam soil, the loss of organic matter amounted to 18.3 percent. When grown in a 3-year rotation of corn, oats and clover the loss was reduced to 11.7 percent.

The difference obtained in a similar experiment on Marshall silt loam soil was even greater. Where corn was grown continuously for 10 years, 15.6 percent of the organic matter was lost while the loss was only 0.9 percent where a 3-year rotation of corn, oats and clover was followed.

Another important reason for following a good rotation which includes legume and grass sod crops is to reduce soil erosion and conserve water. Close growing crops, like legumes and grasses, protect the soil from erosion and enable it to absorb more of the rainfall. This has been well demonstrated from studies carried on at the Experimental Farm in Page County during the past 14 years. The average loss of soil from the different crops of a 3-year rotation was as follows: From corn, 18.4 tons per acre per year; from oats, 10.1 tons; and from clover sod, only 0.2 ton. This shows that practically no soil was lost where red clover, alfalfa or bluegrass was grown, but large losses occurred where corn was grown. The runoff was also much greater with corn.

Legumes and grasses in the rotation also reduce the loss of soil and water during the years following the plowing of the sod. In the experiment on Marshall silt loam, land in corn following clover in the rotation lost less than one-half as much soil and only two-thirds as much water as where corn followed corn.

The reason for this difference is that sod crops improve the physical properties or tilth of the soil. This makes it possible for the soil to absorb more water so there is less water to run off and cause soil erosion.

The beneficial effect of sod on soil tilth is also important. Following continuous cropping with corn the soil turned up in large clods when plowed, whereas the corn ground that had been in clover 2 years previously had very few large clods and was in good physical condition when plowed.

The kind of rotation that should be followed on a given farm depends on the fertility of the soil and how easily it erodes. In general the less the organic matter content of the soil and the more sloping the topography the greater should be the proportion of legume and grass sod. On soils of rolling topography, rotations should be supported by such erosion control practices as contouring or terracing. The use of these practices will reduce the proportion of sod crops needed in the rotation.

We shall discuss briefly a few examples of some standard rotations that fit different general soil conditions.

*Group A—Level Soils*

Since these soils are not subject to erosion, the proportion of legumes in the rotation need not be as large as on soils of rolling topography. One of the most common rotations followed on such soils is a 4-year rotation of corn—corn—oats—clover. This rotation provides for 50 percent of the land in corn or for a 1 to 2 ratio of soil conserving to intertilled crops. If soybeans are grown, part of the corn land may be used for soybeans without changing the general rotation plan.

We have had such a 4-year rotation of corn—corn—oats and clover-timothy meadow on plots at the Agronomy Farm at Ames since 1915, and good crop yields have been maintained. During the past 5 years the yield of first-year corn on these plots has averaged 63.3 bushels per acre where the soil received no other treatment during this period, and 80.5 bushels per acre where lime, manure and phosphate had been used regularly. This experiment is located on Webster soils, which are high in organic matter and quite level.

*Group B—Gently Rolling*

On many gently rolling soils or on only moderately productive soils the ratio of soil conserving to intertilled crops should be about 1 to 1 instead of 1 to 2 as in Group A above. This type of rotation is best illustrated by the 3-year rotation of corn—oats—clover. It is a rotation that has been followed by many farmers in some sections of the state. One objection to it where one desires to grow alfalfa is that it has only 1 year of sod. In order to overcome this objection and still maintain a ratio of soil conserving to intertilled crops of 1 to 1, a 5-year rotation of corn—corn—oats and 2 years of an alfalfa-bromegrass mixture can be used. In this rotation 40 percent of the land is in corn instead of 33 percent as in the 3-year rotation of corn—oats—clover.

*Group C—Rolling to Hilly*

A third group of soils are those on which about 2 acres of soil conserving crops need to be grown for each acre of intertilled crops to control erosion and maintain fertility. These are the rolling to hilly soils. A common rotation for these soils is a 4-year rotation of corn—oats and 2 years of alfalfa - bromegrass mixture. It has only 25 percent of the land in corn and permits good control of erosion during the 2 years of sod, but it needs to be supplemented with such erosion control practices as contouring, strip cropping or terracing.

*One or Two Years of Corn?*

In two of the rotations that have been described, corn is grown 2 years in succession. With the Group B soils, many farmers grow 2 years of corn in succession in order to have more than 1 year of sod and still maintain a fairly high amount of corn or intertilled crops.

The disadvantage of this system is that the growing of 2 years of corn in succession is conducive to soil erosion. Moreover, the question has often been raised as to the comparative yields of first and second-year corn. Tests at the Agronomy Farm at Ames and at the Soil Conservation Experimental Farm in Page County help answer this question.

In all experiments the first-year corn outyielded the second-year corn. During the favorable crop years of 1943 and 1944 the first-year corn averaged 20.8 bushels or 30.2 percent higher than second-year corn at Clarinda and 11.7 bushels or 13.5 percent higher at Ames. The long time averages which include a number of dry or unfavorable seasons give values of 6.1 to 8.5 bushels in favor of first-year corn, or an average of about 16 percent. The reason for these differences is that the beneficial effect of the legume sod in making nitrogen available and improving soil tilth (physical condition of the soil) only partially carries over into the second year.

*Use of Cover Crops*

The shortcomings of a rotation with 2 years of corn or intertilled crops in succession can be partly overcome by seeding a legume cover crop in the first-year corn. Not only will the cover crop protect the soil from erosion but it will supply nitrogen for the second-year corn.

Rye and vetch or sweetclover on land supplied with lime, and rye and vetch on unlimed or acid areas have been successful as cover crops when broadcast with a cultivator attachment or endgate seeder either before or after the last cultivation of corn, or

when seeded in standing corn with a one-horse grain drill about Aug. 15. In about 1 year out of 5, on an average, good stands will not be obtained at the time of last cultivation because of July or early August drouths or because of grasshopper or chinch bug injury. Seedings of rye and vetch made between Aug. 15 and Oct. 1 seldom fail, but those made about Aug. 15 make the most growth. Seeding of sweetclover should be made by Sept. 1.

*Use Alfalfa-Bromegrass*

During recent years the experience of many farmers and the results of experimental work have emphasized the value of alfalfa and bromegrass grown together as a perennial hay and pasture crop. An alfalfa-bromegrass meadow or pasture produces a large yield of high quality feed on adapted land and is very effective in controlling erosion. So we may expect an increase in the acreage of this important crop combination in the next 10 years.

You may wonder, "How can I best fit this valuable crop regularly into my rotation and at the same time grow the desired acreage of intertilled crops?" Hilly and steep fields should, of course, be in grass-legume pastures or meadows as much of the time as possible in order to protect the land from erosion. The problem is with the less rolling land, or the land that is in regular rotation. There is a strong tendency to keep the alfalfa-bromegrass meadow or pasture 3 to 4 years, or as long as it is producing well. The result is that the other cropland on the farm is kept in corn or non-legume crops for several years in succession—a situation that reduces yields and encourages erosion.

On level or gently rolling soils it would be much better to keep each field in meadow or pasture not more than 2 or 3 years, and thus maintain the productivity of all fields on the farm. This can be done on many farms by using a 5-year rotation, previously described, of corn—corn—oats and alfalfa-bromegrass for 2 years. This rotation provides for 40 percent corn or intertilled crop and 40 percent of perennial meadow.

If you want to avoid 2 years of corn in succession on rolling land, this rotation can be readily changed to a 6-year rotation of corn—oats (with sweetclover crop for green manure)—corn—oats—and 2 years of meadow. In this rotation, the two corn crops do not occur in succession, and a legume crop precedes each corn crop. At the same time 33 percent of the land is in corn.

# No Feet—No Horse . . . No Udder—No Cow

**Condensed from American Agriculturist**

NATURE provided cows with udders to produce enough milk to feed a calf until it could live on grass. A maximum of about 15 pounds a day for 3 or 4 months did the trick, with some to spare.

Man decided to improve on nature, and has bred cows to produce 12,000, 20,000, 30,000 or more pounds of milk in a year. It takes a real udder to produce that much milk.

A dairyman can easily get a mental picture of an ideal udder, but it's a different story when he attempts to raise or buy a cow that has one. Yet breeding progress is made by men who have an ideal in mind and strive to approach or reach it.

Many qualities are combined in a high producing cow, but a good udder is perhaps the most important single requirement. A cow may have a great capacity to eat and digest feed, a rugged constitution, and plenty of dairy character but if she has a poor udder, she won't last long and is not the cow to buy or keep.

What is your idea of a perfect udder? Most dairymen stress these points:

(1) *Quality*

Quality is more important than size. An udder may be meaty and be nearly as large after milking as before. Meaty tissue is just extra weight for the cow to carry around.

(2) *Capacity*

It takes a big udder for big production. That means an udder that is long, attached well forward, and high and wide in the rear.

(3) *Strength*

A strongly attached udder, with quarters of equal size, and with the floor of the udder reasonably flat and not lower than the cow's hocks, is an udder likely to continue heavy production year after year. Any udder grows as the years go by. If it is weakly attached, it sags lower and lower and exposes itself to injury.

(4) *Good Teats and Milk Veins*

Teats of good size squarely placed are especially important if cows are milked by hand. Easy milking is a big advantage. Short teats are a severe handicap in hand milking.

Some judges place less emphasis than they once did on long, tortuous milk veins. We still like to see them.

FAULTS TO AVOID

Udder faults to avoid are those opposite to the good points already mentioned. However, they will bear repeating.

**Reprinted by permission from the American Agriculturist, Ithaca, N. Y., Nov. 3, 1945**

(1) *Meaty Udders*

Udder quality can be determined by handling, but the best test of a meaty udder is to examine it after the cow has been milked. A milked-out udder should be soft and pliable.

(2) *Small Udders*

In judging udder size, make due allowance for the cow's age and stage of lactation. Do not be fooled by the udder that hangs below a cow's hocks. It isn't as large as it looks and it's a weak udder that will kill the cow's usefulness while she is still young.

(3) *Pendulous Udders*

They have already been described. Avoid them. They are more likely to be found on old cows.

# New Ways of Living

**Condensed from Rural Electrification News**

"We really do sing up a storm on Sunday nights." That's the way a member of one of the churches in Carroll County, Georgia feels about the new spirit in his church, now that it has lights. His enthusiasm is typical of the people of Carroll County, who have banded together with the cooperation of the West Georgia College's students and faculty to work out solutions to local problems and plan their own future in the democratic, cooperative way.

The story of Carroll County and its college has traveled far beyond its borders. It has brought to this community, which has one of the largest rural populations in any county of Georgia, the careful attention of educators throughout the south, in the east, and as far away as England.

Carroll County's story is one of people working together; of teachers joining pupils and their parents in solving community tasks; of new ways of living, of doing business and enjoying life, through modern methods.

In recent years, and in the face of wartime obstacles such as labor, machinery and gasoline shortages, the people of Carroll County are canning more of their own home-grown food, grinding their own feed, curing sweet potatoes effectively, growing more pasture and cover crops, and raising more livestock and poultry. High on their list of postwar plans is increased dairy production.

In working out these new approaches to old problems, they are using cooperative ways almost entirely. Their membership in the Carroll County Electric

Reprinted from Rural Electrification News, Washington, D. C., Feb., 1945

Membership Corporation falls naturally into the pattern of their membership in other cooperative groups.

Leaders of the college, using Carroll County consolidated schools as demonstration centers for their student teachers, have helped rural communities in the county to build this cooperative approach to their problems. Teachers-in-training have made gardens, worked up health programs, and done many other tasks in collaboration with their neighbors.

Here's an example of how cooperation works: the little community of Tallapoosa needed its own mill. Many small mills in the vicinity had closed and it was difficult to get grain and feed ground elsewhere. So, with the help of the college, the people of this community organized a milling cooperative in 1942, by selling 500 shares of stock at $2.50 per share. A feed mill and a grist mill were found in another part of the state and brought to Tallapoosa in trucks. Today both mills are run by a 30-horsepower motor at a power cost of less than $20 a month. The Tallapoosa farmers and those from nearby localities bring their own grain for grinding and take it away fresh. The Co-op is free and clear of debt, most of the mill's machinery is new, and there is a reserve of $718.66 in the bank. A sign on the mill says that the people of Tallapoosa have paid for many mills, but this is one they own.

Tallapoosa also needed a cannery. People were preserving more of their own home-grown food, and needed some central spot to process it. So 125 householders formed a Co-op, bought an old lunch wagon in town, sawed it in half, brought it to the Tallapoosa school house and reassembled it. Total cost—$550. In one summer 45,000 cans were put up for 175 or so families, and some were sold under the label of the Co-op.

Tallapoosa's school now has a women's clubhouse, where demonstrations are held, and a kitchen where lunches are served. And the community bought a tractor which it works cooperatively.

This pattern has been repeated in many other Carroll County places. The extension division of the University of Virginia, which made a study of the county, tells about the Smyrna community's need for a sweet potato curing house. Plans progressed slowly until the children of the Smyrna school brought facts, figures and drawings to a community meeting to prove that hill-cured potatoes spoiled more rapidly than house-cured ones. In fact, they even brought spoiled potatoes from

nearby homes to prove their point. The adults subscribed $115 for a curing house. The children plan to electrify it after the war, or before, if possible.

Sand Hill Community's consolidated school is the center of a cooperative development including six smaller communities. The school building is wired for light and power, as are all but three of the county's white schools and a few of the Negro schools, and its auditorium is the center for community group activity. The school boys and girls enjoy movies and radio. Success of bond rallies was credited by drive authorities in large degree to the inspiring films shown at the electrified schools. And the Sand Hill School, like the others, serves daily hot lunches prepared at the center.

Near the school a building is being set up for an auto repair shop, a blacksmith shop, a woodworking shop and a barber shop, all served by Co-op power.

P. Alston Waring, author of "Roots in the Earth," said in describing the Carroll County development, "The children in these schools are learning with their parents how to build a better rural life,."

## Suits from Chicken Feathers

Announcement comes that scientists in the research laboratories of the United States Rubber Company have developed a new fabric made primarily from chicken feathers which is designed for use in suits, dresses, sweaters and other wearing apparel. It is reported that the new fabric made from chicken feathers is warmer, softer and looks like wool. It can be dyed any color and possesses a brilliant lustre. It is odorless and can be laundered in soap and water and with no more shrinking than cotton. It is reported that there are 100 million pounds of chicken feathers and 30 million pounds of turkey feathers going to waste in the United States every year. The scientists declare that three-fourths of the feathers of the fowl can be used and 80 per cent of each feather is suitable for making yarn. Ten chickens of the broiling size will yield a pound of feathers. To make an average size man's suit the feathers of 38 broilers would be required. With this new scientific development, perhaps now there will be a market for this waste product of the farm.

*—West Virginia Farm News*

# Know Your Soil for Tomatoes

Condensed from Better Crops With Plant Food

*Jackson B. Hester*

Department of Agricultural Research, Campbell Soup Company, Riverton, N. J.

NEVER before in the history of man has there been available so much knowledge about soils. There is on record a tremendous amount of information about the genesis of the soils, the classification, the physical attributes, the chemical composition, the agronomic aspects, and the economic value. Practically all of the agricultural soils of the United States have been carefully surveyed and mapped according to their physical attributes and economic value. Practical knowledge of growing crops accumulated through the ages is bountiful, yet it is no trivial task to make a success of farming. To be a successful grower one must know his soil.

Perhaps one of the most fundamental things learned by soil research is that all soils differ. Strange as it may seem, they differ in practically every respect. No two soils have the same physical composition. Further, the chemical composition of all soils differs and so on down the list of sciences involved in soil research. The variations in color of soils on a single farm are familiar to every grower. The soils of New Jersey have all been classified and there are 193 different soil types in the State and 51 different soil series.

Upon talking with a successful grower about his soils he will tell you of many differences in his fields. He will tell you he can plow one field two days after a rain, but he has to wait three days for another field. He will tell you that one field is best suited for the culture of strawberries, another field for potatoes, and a third field is best for tomatoes. Yet there is no perfect soil. Fortunately, man has studied the defects and has learned how to correct or get along with these defects. There has been accumulated a great deal of information on the production of tomatoes. Since crops differ so much in their requirements of a soil, it is fitting to take this one crop and try to outline some of the knowledge one should have in growing it successfully.

All soils are composed of sand, silt, and clay. The amount of one or the other of these constituents determines the texture of a soil.

Reprinted by permission from Better Crops With Plant Food, Washington, D. C., June-July, 1945

A soil with a high sand content has an open texture and may be well-drained, whereas one with a large amount of clay has a close texture and may be poorly-drained. However, the latter statement is true only within a limited range for the composition of the clay has a great deal to do with the way it clings together or becomes packed. Some clays cling together in crumb-like structure and are well-drained. However, these two types of soils are entirely different in nature and must be farmed in an entirely different manner to produce successful crops. In the production of tomatoes in the humid region, soils that are well-drained must be selected. In other words, tomatoes should not be placed on soils that have low wet spots in them. Each grower must study his soils and avoid those fields that are likely to become "water-logged" during the growing season. True, low wet fields may produce a good crop during extremely dry years, but one must take the soil selection that is most likely to produce a good crop during the average year and a fair crop even in the worst years. The nature of the drainage of the soil can be obtained by an examination of the subsurface soil (B horizon). If the soil below the surface or plowed horizon shows a mottled condition instead of a uniform color, the soil is not likely to produce a superior crop of tomatoes because of the lack of adequate drainage.

On the other hand, soils that are extremely sandy in nature are difficult to handle. The plant food supply and water-holding capacity are more than likely to be insufficient for economical yields. Therefore, select a uniform soil that has good internal and surface drainage whenever possible, but above everything study the soil type and farm it accordingly. Once the soils have been classified in respect to drainage and soil type and a system of management developed, select system of crop rotation for the soil types and farming practices.

Commercial fertilizers and lime are only supplementary to soil fertility. In other words, plant food from fertilizers only supplements that already found in the soil and cannot be expected to be the sole support of crop production. One of the most successful ways to maintain soil fertility is by proper crop rotation. By this is meant a system whereby soil depleting crops are not the only ones grown in the rotation.

Tomatoes do exceptionally well after sod crops, corn with the stover returned, wheat, rye and oats with straw returned or after almost anything whereby a large

amount of organic matter is plowed under. Corn, wheat, rye, oats, etc., give a cash return as well as add organic matter to the soil. The best of all is to have tomatoes follow leguminous crops like Ladino clover, soybeans, alfalfa, and the various other soil-improving crops where at least a goodly supply of organic matter is returned to the soil. These crops furnish fresh organic constituents for the soil microbiological life to live upon and make available to the cash crop much of the plant food (calcium, magnesium, nitrogen, phosphorus, and potash) required by it, to say nothing of the minor plant food elements (iron, manganese, zinc, boron, etc.).

The organic matter added to sands decomposes more rapidly than that added to heavier soils. Therefore, when organic matter is added to sands a cash crop should be growing to get the benefit of it. Select cover crops that make the best growth on the soil under consideration. Fit the rotation to the soil type. The physical aspects of the soil are improved by the decomposition and building up of the soil organic matter.

The water-holding capacity and plant food supplying power of sandy soils and the drainage, aeration, and plant food supplying power of heavy soils are improved by proper crop rotation. In short, a continuous economical crop production is dependent upon a proper crop rotation. Soils should not be allowed to remain bare over the winter if this can be avoided because erosion by wind and water and the leaching of plant food is too expensive. Organic matter should never be burned off of the land because the organic matter is destroyed and nitrogen goes off into the air.

While the proper degree of acidity or alkalinity in the soil for the ideal growth of most crops has been very well established, to obtain this condition is an individual problem for each soil. The soil clay and organic matter have the power to hold available the plant food necessary for the growing crop. This same complex becomes acid in nature and depleted for bases (calcium, magnesium, potassium, and sodium). For the optimum growth of tomatoes, most vegetable crops, and many farm crops, this complex should be about 60 per cent saturated with calcium and about 20 per cent saturated with magnesium. In other words, when the soil is limed the acid nature of the clay and organic matter is saturated with the calcium and magnesium supplied by the liming material. This phase of soil improvement is very important.

However, soils differ tremen-

dously in the amount of lime necessary to give the desired results. The pH value of the soil only gives the extent of the depletion, but a test for calcium, magnesium, and the organic matter content and a knowledge of the soil type give information for determining the lime required. Each successful grower must have this information either through scientific analyses or through practical study. It is far easier and less expensive through laboratory studies than through practical experiments. Sandy soils change more rapidly than heavy soils and must be subjected to chemical analyses more often.

Satisfying the lime requirement of the soil is only another step in getting ready for maximum crop production and supplying the other major plant food elements is another necessary step.

The amount of nitrogen held in the soil is almost entirely associated with the organic matter content. The rate at which it becomes available is almost entirely dependent upon the texture of the soil, the composition of the organic matter, and the prevailvailing climatic conditions. The soil organic matter analyzes about 5 per cent nitrogen; therefore, if a sandy loam soil has 15 tons of humus to the acre (1.5 per cent) it will have approximately 1,500 pounds of nitrogen to the acre. Of this, probably less than 5 per cent will be nitrified in a year. Since some of the nitrogen is lost to the air and some leached, it is obvious that the supplemental must be supplied from cover crops, manure, and commercial fertilizer. A crop of 10 tons of tomatoes will utilize more than 100 pounds of nitrogen and it requires a ton of 5-10-10 fertilizer to supply 100 pounds of nitrogen. However, if the mere addition of 100 pounds of nitrogen to the soil was all that was necessary to supply the nitrogen, it would be pretty simple, but this nitrogen must become available as the plant needs it or it may be lost through leaching. The status of the absorption of nitrogen by 3,000 tomato plants is approximately 3 or 4 pounds the first month, 25 or 30 pounds the second month, and 50 or 60 pounds the third month. However, the plant is not in physical contact with all of the soil so there must be actually more than the above specified amounts available in the soil at any given time. Heavy silty loam soils may have 3 per cent organic matter and, due to the clay content, would have to have that amount to be equal in immediate fertility to a sandy loam with 1.5 per cent organic matter. A silty loam with 3 per cent organic matter would have 30 tons of humus or

3,000 pounds of nitrogen. However, due to the compact nature of the soil the organic matter would oxidize more slowly and would only give available about the same amount of nitrogen as the sandy soil.

The safest way to have adequate nitrogen in the soil available to the plant is through a good organic matter content and supplemented by plant debris, manure, and commercial fertilizers. An analysis of the soil for the organic matter content and a knowledge of the plant material returned to the soil give the grower a working basis for nitrogen fertilization.

*Phosphorus*

The phosphorus requirement of the plant is about one-third as much as nitrogen in actual weight, but there are more phosphate-deficient soils than there are nitrogen-deficient ones and still there is more phosphorus applied as commercial fertilizers. This is due to the fixation power of the soil. In other words, it is difficult to keep phosphorus available to the plants even though it is not leached from the soil. This fixation varies tremendously from soil to soil. Strongly acid soils fix in an unavailable state more phosphorus than properly limed soils; soils well supplied with organic matter fix less than soils poorly supplied, and red and yellow soils more than gray and brown soils. A thousand pounds of 5-10-10 fertilizer will supply three times as much phosphorus as is needed for a 10-ton crop of tomatoes. However, many soils will require more phosphorus than that to produce 10 tons. To safeguard a crop from phosphorus deficiency, lime to about 80 per cent of the lime-holding capacity (pH 6.2 to 6.5), supply organic matter in abundant amounts, and use selected methods of applying the phosphorus, but above all find out if your soil is the type that has a high phosphate requirement.

By far the largest amount of any of the plant foods needed by the plant is potash. Whereas 100 pounds of nitrogen and 35 pounds of phosphoric acid are used by 3,000 tomato plants, 200 pounds of potash are required for a 10-ton crop of tomatoes. While little over one-half of this is taken off the soil by the fruit, the total amount is required to produce the crop. Since most satisfactory crops produce from 15 to 20 tons of tomatoes (harvested 10 to 15 tons), it is readily seen that the use of adequate potash is necessary. Most of the soils in the eastern part of the United States are deficient in potash; therefore, it is necessary to supply a large part of it in commercial fertilizers.

However, here again soil-improving crops in the crop rotation are important.

A knowledge of the amount of readily available potash in the soil can be learned from a quick analysis of the soil. A crop-producing program to maintain in an available state an adequate supply of potash can be established if one knows his soil conditions.

There is available a wealth of practical and scientific information about soils, but for a grower to succeed he must know his own soil. He must study this soil, find out when to plow it and how to plow it to get it into the best physical condition for the crop to be grown. He must learn the status of lime in the soil and know how much is needed to put the soil in an ideal condition for crop growth as well as how to apply it and when. He must know how much organic matter he has in his soil and whether his crop rotation is building or tearing down his supply. He must know how much nitrogen, phosphorus, and potash are required and how to apply them. The grower must get this information through a system of analyses of his soils, or through the hard way, by trial and error. Last, but not least, the grower must be open-minded and receptive to new ideas. He must study scientific information advanced and think about his conditions and see if he can apply the information to his farm and farming practices. In other words, he is the master of his own ship and where he steers it, it will land.

# Leaf Analyses Show Needs

**Condensed from New England Homestead**

*Lawrence Southwick*

MINERAL analysis of leaves of fruit trees to determine certain fertilizer needs is demanding increasing attention among horticulturists. The amounts and proportions of some of the essential major "food" elements actually found by chemical analysis in the leaf tissue of an apple tree, for example, seem to give a more reliable indication of the nutritional status of the tree than most other measures. Soil analyses and particularly the so-called "quick soil" tests are often useful in determining fertilizer requirements, but the actual intake of nutrients as reflected in leaf analyses may give an even clearer picture.

Consider the case of magnesium. This vital mineral element

**Reprinted by permission from the New England Homestead, Springfield, Mass., Oct. 13, 1945**

has been proven to be seriously deficient in many northeastern apple orchards in the last two or three years largely through chemical analysis of foliage from trees showing varying amounts of leaf scorch symptoms. Analysis of many samples of leaves at the Massachusetts Experiment Station has shown a definite association between the amount of magnesium in the leaf dry matter and scorch severity. Thus, trees with foliage containing less than 0.25 percent of the dry matter as actual magnesium are very likely to be suffering and will often show magnesium deficiency symptoms. However, even without clear-cut symptoms, which are very variable, a low analysis furnishes accurate proof of need. When this is learned, measures can be undertaken at once to correct the deficiency before it becomes severe and causes irreparable damage.

It is also very important to consider relationships of the various elements. For instance, magnesium deficiency seems to be aggravated when potassium is abundantly available. When leaf analyses reveal low magnesium and high potassium, the deleterious effects on trees may be more severe than when the level of potassium is lower. In short, correct interpretation of analytical results is essential and requires an understanding of what is often called nutrient balance.

Proceeding further, sufficient data is available to allow determination from chemical analysis of the relative nutritional status of potassium and calcium. It is now rather widely accepted that the approximate minimum amount of each of these elements in healthy apple foliage is around one percent of the dry matter. When leaf analyses reveal lower levels, it is probably time to apply corrective measures.

It is reasonable to expect further progress in determining certain fertilizer needs directly and accurately by means of chemical analysis of leaves and other plant parts during the growing season. Not only should more exact interpretation of data be possible as experience with this method is broadened and intensified, but increased direct usefulness to orchardists should inevitably result. For example, periodic "chemical examination" of leaves in commercial orchards should be extremely helpful in ascertaining nutrient requirements and in forestalling serious outbreaks of individual deficiencies. Although this service is not now generally available to orchardists, it should be in the near future if there develops sufficient and sustained interest on the part of growers.

# Hay Drying Bins for Small Farms

Condensed from Electricity on the Farm

*R. C. Paslay*

Commercial Sales Manager, Louisiana Power & Light Company, Algiers, La.

A SIMPLE easy-to-build hay-drier has been in use for the past three years on the farm of Mr. Walter Cooke, Hammond, Louisiana. Built purely as an experiment, the drier worked out so satisfactorily that Mr. Cooke has used it to dry all the hay used on his farm. Because of the size of the bin Mr. Cooke has not attempted to dry hay to sell. However, plans are now completed to build a much larger drier and larger storage bins equipped with machinery so that the dried hay may be chopped, stored and handled easily.

This original drier is built in one corner of the barn in a space formerly used as a feeding stall. The size is 11′ x 26′ x 12′ high. Only two walls had to be built. The top, of course, was left open. Then all four sides were lined with building board to prevent air leakage. Supporting sills 8″ x 8″ in size were installed on each side, and down the middle of the bin. The tops of these sills are 24″ from the floor at the front and slope to 12″ at the rear wall. Across these sills were laid logs or saplings, of from 4″ to 6″ in diameter, cut from a nearby woodland. These logs were spaced 9″ to 15″ apart. In effect, the logs form a heavily slated supplemental floor 24″ above the solid floor at the blower side and 12″ at the rear.

In the front wall an opening 22″ x 24″ was left so that a blower could be placed on the floor, with the blower discharge making a tight fit in the opening. The blower builds up air pressure under the hay on the poles. Only a small amount of ceiling and "chinking" was necessary to prevent air leakage. This being an experiment Mr. Cooke installed a small American "Sirocco" multi-vane blower equipped with a one-half horsepower motor. It was his plan to dry only a small amount of hay. The capacity of the blower was sufficient to give him 25 cubic feet of air per minute (cfm) per square foot of bin floor space. His first batch only partially filled the bin. This turned out so satisfactorily that it was evident a larger quantity could be cured. The bin was com-

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pletely filled the next time to a depth of 12′ and the results were still good. About six tons of hay are now cured at one time.

*Quality of Hay Excellent*

The quality of the dried product is excellent. The color is good and the nutritive value of the hay was proved by the fact that his cattle have only a small amount of cottonseed meal in addition to the hay. A black Angus bull has been kept in a lot for fifteen months and has been fed nothing but chopped dried hay and cottonseed meal. The animal is healthy and has retained his full weight. Year 'round the animals eat the hay with relish.

A variety of different kinds of hay has been cured in the small drier. It includes vetch, oats, cow peas, alsike clover, peanuts and the regular run of grass hay made up mostly of Bermuda and crab grass.

Since the drier was an experimental unit, Mr. Cooke says "we did not worry about the cost or the amount of labor required to get the hay into and out of it. We simply forked it in and forked it out. After the hay was cured it was put through a Letz mill set at 3/16″ cut, which chopped it into lengths of about ½″ for feeding."

Of particular interest is the simplicity of this installation. It happens that the floor in the barn where the bin was built was of concrete, but it is not necessary to build a concrete floor. The logs or saplings hold up the long hay and allow space underneath so that the air may be blown under the hay and up through it. No complicated carpentry is required. It is just necessary to have the air compartment beneath the hay tight so the air will be forced up through the hay. When built under an existing roof, no cover is necessary. Provision must be made, however, to bring fresh air to the blower intake and to discharge the moisture laden air from the top of the hay into the open through large ventilation openings in the barn.

From accurate records kept during the three years of this drier operation, Mr. Cooke figures that the electric power has cost him 80 cents per ton.

The operation of this small drier has been so satisfactory that a larger one is now being built. In addition to being a farmer, Mr. Cooke is an air-conditioning engineer. Some of his conclusions based on his experimental drier are of interest. One is that he will use a blower which will give him 50 cfm per square foot of mow area. He says—

"Without going into any technical details as to why I have decided to use 50 cfm per square foot of mow area instead of the

10 to 12 cfm used in many of the Tennessee type driers now installed, let me say there was some discussion at the Knoxville Hay Drying Conference last December of the adequacy of 10 to 12 cfm for proper curing. In our Louisiana territory I have seen two, three and four days in a row in which our humidity hung at about 90 while we were attempting to dry hay. When we used 20-25 cfm under very humid conditions in the experimental drier, we found a mold formation in the upper 6″ layer of hay. That was when we were stacking the hay 12′ deep. In the new drier we will pile the hay 16′ high as it is cut, without any field curing whatever. Now I am not advocating this quantity of air for other localities where I know the humidity is much, much lower than here in Louisiana. It has just been our experience that the hay we get from our drier is too valuable a product to take any chance on not having enough air.

"In the design of the new drier which is now almost completed, long hay will be put into and taken out of the drier with a hay hook and an electric hoist. Under our system of handling hay on the farm, using a side delivery rake, hay loader and the electric hoist with hay track over the drier, the only time we will hand fork hay is when the dry hay is put into the mill for chopping and blowing into storage bins. Where more than one bin is used, the chopper might be placed between the bins so the hay could be handled out of the bins to the chopper with the least effort.

"At the present time I am figuring with some farmers on experimenting in curing hay in the drier that has been cut to lengths of 3″ or 4″ with an ensilage cutter. We will first place a thin layer of unchopped hay over the log floor of the drier and then put the chopped hay in on top."

# Soybean Oil Meal for Beef Cattle

**Condensed from The Dakota Farmer**

*W. E. Simonson*

AMERICAN livestock have for years suffered from protein starvation. This has, in many cases, resulted in small profits or even financial losses from feeding ventures. It has been much easier for the feeder to evaluate the different feeds, that might be given the laying hens or the dairy cows, when the eggs could be counted each day or the milk weighed twice a day, than it is with beef cattle where the gains are seldom known until the cattle go to market.

As a result, cattle feeders, after years of costly experience, have found that they produced good gains when using a certain formula and they are very reluctant to change the formula because of the difficulty of measuring the comparative value of other feeds. Changing amounts of various available feed supplies make it necessary or more economical to change feeding formulas from time to time.

With the present limited supply of some protein oil meals and the comparative liberal supply of soybean oil meal, many cattle feeders are finding it desirable to use soybean oil meal as the principal protein supplement for feeding beef cattle. Such use, based on a knowledge of the characteristics of soybean oil meal and substantiated by considerable experimental work, is proving to be profitable to many cattle feeders.

One of the first things to note in the use of soybean oil meal for feeding cattle is that cattle learn to like it so well that they will often select it in preference to other ingredients in the ration unless it is thoroughly mixed with the grain or silage. It is also good practice, at the start of the feeding period, to use soybean oil meal with the grain to avoid excessive protein hunger. Properly balanced rations promote normal feeding and maximum gains.

It is good business to feed soybean oil meal whenever cattle are eating corn, corncob meal, corn silage, corn fodder or any corn product. The technical reason for this is the low protein content of corn products and the fact that soybean protein combines especially well with corn protein. This may be the underlying reason for the exceptional value of soybean oil meal for use in rations for growing and fattening beef calves.

**Reprinted by permission from The Dakota Farmer, Aberdeen, S. D., Nov. 3, 1945**

When soybean oil meal is added to a cattle ration containing corn, less feed is required per unit of gain than when a ration is made up of less efficient proteins.

Remarkably good results have been observed when small to moderate amounts of soybean oil meal were used in combination with corn or some corn product. The Nebraska North Platte Sub-Station report on comparative values of protein feeds for steer calves, shows that one pound of soybean oil meal per day with silage had a feeding value 5.7 times that of alfalfa hay—that is, when alfalfa hay was worth $10 per ton, soybean oil meal had a feeding value of $57.50 per ton.

Purdue Agricultural Experiment Station reported steer feeding trials September 13, 1939, in which steers were fed shelled corn, silage, clover hay, and salt, with one lot receiving 1½ pounds cottonseed meal per day and another lot receiving 1½ pounds soybean oil meal per day. The steers receiving the soybean oil meal made $8.27 more profit per head than those receiving cottonseed meal when the cost of the two kinds of protein supplements was the same per ton.

Another interesting lot in this same report received the same basic ration as above but with ¾ pound soybean oil meal per head per day. This lot of steers made $4.92 per head more profit than the cattle receiving 1½ pounds per head of cottonseed meal per day and within $3.35 per head as much profit as those receiving 1½ pounds soybean oil meal per day. These figures indicate that in most cases the use of ¾ pound to 1½ pounds per steer per day of soybean oil meal is practical and profitable.

Rex Beresford, reporting in Iowa Farm Economist for July, 1944, estimated that land producing at the rate of 70 bushels of corn per acre would yield the corn, clover hay, and corn silage sufficient to produce 781 pounds of beef per acre if 1½ pounds soybean oil meal were fed per animal per day. If the margin on the cattle is used to pay for the soybean oil meal and the 781 pounds of beef sold for 14½ cents per pound, the return would be $109.34 per acre; this is truly a remarkable return for land use.

When we calculate the amount of corn, corncob meal, corn silage, corn fodder, and other corn products available for cattle feeding in the corn belt states and the increased returns to be secured by adding soybean oil meal, the total figures become astronomical. The proper selection of feeds and use of proper feeding methods determine the success or failure of individual feeders.

# Hunt Broad-Breasted Chicken

Condensed from Missouri Ruralist

THE 2-billion-dollar poultry industry has been challenged. Its leaders want it to produce a fast-growing, better meat-type chicken to help retain the markets poultrymen have won during the current meat shortage.

A national contest to develop a broad-breasted chicken—comparable to the popular broad-breasted turkey—was decided upon when 14 poultry association officials and key poultrymen of the U. S. Department of Agriculture met recently in Chicago, D. D. Slade, secretary, International Baby Chick Association, Lexington, Ky., was elected chairman of a supervisory committee to make plans for the project.

The program originated several months ago in a speech made before a group of Canadian poultrymen by Howard C. Pierce of A & P Food Stores, which included this statement: "Probably the most welcome discovery to the producers of chickens would be the development of a chicken of a type similar to that of the broad-breasted turkey." Parts from the talk were picked up by some of the poultry journals, one of which based an editorial on the statement, with the conclusion that "This offers a real challenge to poultry breeders."

Due to this favorable reaction, Mr. Pierce discussed the matter with several poultry association officials. After these conversations, industry leaders were asked to meet to discuss the proposed contest. The group organized and elected Mr. Slade as chairman. Four sub-committee chairman were elected to work out technical details of the contest and to develop specifications for the bird considered most ideal. This bird will be diagrammed on plaster casts, showing desired physical characteristics, for distribution to breeders and agricultural colleges.

The contest will last 3 years and bring a $5,000 cash prize to the poultryman breeding the best meat-type bird. Annual progress awards will total $3,000. These funds have been made available to the committee by A & P, in addition to a sufficient sum to cover administrative expenses of the committee and sub-committees.

"The program is designed to crystallize thinking among all poultry breeders, from the large hatcheryman to the owner of a small flock, on a chicken with an abundance of carvings," Mr.

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Slade announced. "The committee will set standards for a bird which will have a greater per cent of meat to bony structure, larger proportion of white to dark meat, and a broader breast well filled with flesh. In other words, a chicken that will offer a greater degree of flavor and tenderness and contain more meat than ever before produced. The bird must mature rapidly and the breeding stock must maintain high egg production."

From the poultryman's angle, Mr. Slade added, a broad-breasted chicken should mean more economical growth — more meat per pound of feed eaten, which has a lot to do with the profits.

# Four Points to Watch

Condensed from Kansas Farmer

*F. W. Bell*
Kansas State College

SELECTION of individuals by judging their strong and their weak points is the method which has been used to improve livestock for many generations. When the practices followed are based on a clear understanding of the characteristics which are essential for livestock improvement, considerable progress is made. This progress is possible because the law of animal breeding is that "like produces like" or, expressed more clearly, that the offspring tend to resemble their parents. The main reason why many livestock producers fail to achieve their goals is because they do not fully understand and apply the fundamental priciples of inheritance. More study of this law might mean a difference between profit and loss on the livestock project.

In improving livestock by selection, we must keep in mind that 2 general forces are operating in animal breeding: one which causes offspring to be similar to their parents, and another which causes the offspring to be somewhat different from the parents. These 2 forces, likeness and variation, if properly guided thru selection and mating, will improve succeeding generations by retaining the more desirable characteristics of our breeding stock, and adding desirable variations as they occur.

Obviously, there is no such thing as an absolutely perfect animal. But there is a great difference between livestock which has

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been improved thru several generations of careful selection, and those which are produced without regard to their improvement as individuals. It is equally apparent that we cannot produce animals that are exactly alike as we are able to do in making automobiles, washing machines, refrigerators or any other mechanical units. Animals are machines, and very complex ones, but each one is the offspring of two parents, rather than an assembly of parts which can be duplicated as is the case of machinery built in factories.

The object of livestock selection as applied to breeding is to combine as many of the desirable features as possible in the offspring, and to eliminate the less desirable features of the parents. Therefore, if selection is to improve we must mate 2 animals, both of which show the desirable characteristics. Since faults are just as likely to be transmitted as good points, we must select parents which have relatively few faults and many desirable features.

In order to be more certain that the desired characteristics of the parents will be transmitted to their offspring, the parents must have a strong inheritance for good and little for bad. In this fact lies the great value of a good purebred sire. A good individual with an ancestry can transmit only improvement, since undesirable characteristics practically have been eliminated by selection. For the same reason, high-grade females, which are the progeny of herds in which only good purebred sires have been used for several generations, will transmit only good features for the most part.

In selecting livestock to increase efficiency in production we should have 2 major aims. One is to increase the market value or selling price of the products, and the other is to lower the cost of production of animal products.

Principal standards on which packers determine the prices they will pay for live animals are finish, shape, quality, and dressing percentage. Naturally, producers will receive higher prices for their livestock when it comes close to fulfilling the packers standards. This is true of all kinds of meat animals, beef cattle, sheep and hogs. There are differences in the relative value of different parts of the carcasses of each kind of livestock, but the general requirements are the same for all.

To sell well on the open market, meat animals must have a satisfactory finish in order to improve the appearance, flavor, tenderness and keeping qualities of meat. As to shape of carcass, the higher-selling cattle are those which have a greater amount of

meat in the higher-priced cuts which come from the ribs, loins, and hindquarters. That this improvement in shape is the result of selection rather than feeding is clearly shown by the much greater thickness of these cuts in beef steers as compared to dairy steers which have been equally well fed and finished. In fact, the same difference in width is evident in thin cattle, showing that selection for thickness of the higher-priced cuts has increased the amounts of muscle, or lean meat, in these parts.

Quality of meat is determined by texture of flesh and by the distribution of the fat and lean. Smoothness of form and smoothness of fleshing in live cattle indicate quality of meat. An uneven covering of flesh shows too much fat in lumps or rolls. Quality is also shown in head, hair, hide, and bone. Coarseness in these parts indicates coarser texture of meat, as well as more waste in dressing. Consumers might eat more meat if better quality was more often obtainable.

Profits which packers get must come mostly from the sale of carcasses. The prices which packer buyers offer for live animals are determined by their estimate of the carcass grades and the dressing per cent of the cattle before them. When we realize that a difference of only one per cent in dressing means a difference of 300 pounds of beef a carload, we see how important dressing per cent is to the packer. He looks for the fine points.

What can selection do to enable livestock producers to lower their costs of production without lowering the market value of their products?

Nothing is more necessary for successful livestock raising than health and vigor. Only healthy animals can make good gains in weight and reach the desired finish in less time. General appearance is a good guide in selecting for health—such evidence as is shown in bright eyes, glossy hair, alert appearance, and good style. To be healthy, livestock must have plenty of room for the lungs; hence, the chest must be wide and deep, the front legs straight and well apart at floor of the chest.

The daily rate of gain in weight is another very important factor in determining cost of production. Livestock which make quicker daily gains also make their gains at less cost for feed.

A very important characteristic to select for in meat production is early maturity. Early-maturing beef cattle are those which can be fattened while they are growing, as distinguished from the type of cattle which are hard to fatten until they are past the stage of

rapid growth. Most people prefer cuts of beef from light to medium weight rather than heavy carcasses, and they want beef which is tender and of good flavor. To supply this demand beef producers must either raise small cattle, or feed the type of cattle which can be fattened before they reach full size and maturity.

Cost of production is less for cattle of early-maturing type, provided they have enough size, since they are making 2 kinds of gain at the same time. Beef cattle which make normal growth, but lack this ability to fatten at the same time, require much longer to reach market finish, and consume much more feed in making the same amount of beef. By selecting purebred bulls of the early-maturing type to mate with carefully selected cow herds, finished beef cattle of good quality can be marketed at from 12 to 24 months old, with a very material saving in the cost of producing this beef. The characteristics of this type are evident when the calves are born. We call them thick-bodied calves, because they are smooth and compact in form, with a thick covering of muscle or natural fleshing.

A very essential feature of good meat-producing animals is their capacity for feed. By selecting for greater feeding capacity, we are able to increase the rate of gain. Greater feeding capacity requires more room in the digestive system, hence we must select cattle with greater width and depth of body.

In summary, the most important features to emphasize in selection for more efficient production are:

1. Ability to make gains at less cost.

2. Ability to fatten at any age.

3. Thick, natural fleshing, with especially good development in the higher-priced cuts of meat.

4. A good dressing percentage in cattle finished for market.

## Ram Delivery

Instead of traveling the state each fall to buy rams, Wisconsin flock-owners now have a selection of good purebreds brought almost to the farm.

A "ram truck," carrying 50 top purebreds (rams are added en route as others are sold), makes the rounds of 40 to 50 counties in early fall, gives buyers a chance to take their pick at county seats or some other central place.

Started by the State University animal husbandry department in 1936, more than 2,000 rams, consigned by purebred breeders, have been distributed in this way.

—*Farm Journal*

# Soil Fertility and Farm Security

*Wm. A. Albrecht*

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SECURITY in the business of farming depends more on its agronomic than on its economic phases. But one must, however, give careful study to the economic phases in order to realize the truth of this statement. These are facts coming from the analysis by J. O. Martin of some 500 farm records of the borrowers of the Missouri Farm Security Administration in the southwest part of Missouri, as he presented them to the Chamber of Commerce at Springfield, Missouri. The economics point out that the soil—the crop-producing power—is the means by which new wealth is created and is the force that determines how secure the farmer and his family are on the land.

The farming area under study by Mr. Martin is given over extensively to the production of dairy products. It is in the milkshed of Springfield, Missouri, which is a center where a large amount of dairy products are concentrated. It is significant to note that these people are selling their farm output in the form of human food, and a most valuable food at that. The farmers are operating already under one of the closest connections between the soil and its products in the form of human food. They are not growing grain to be sold. Nor are they making products that must be extensively processed before they can feed people. They are using cows to process grass right out of the rougher topography into a most valuable and most complete human food as the result.

These people are in a position to carry out all the phases of the production, namely (a) grow the grass, (b) multiply the cows, and (c) produce the milk. How effectively they do this is the question that deserves consideration. Their efficiencies are demonstrated by the different groups as shown by their farm incomes and the distribution of the money in terms of expenses. The efficiencies, more particularly the degrees of success with which these borrowers are paying off their loans is roughly related, according to Mr. Martin, to the extent to which they help their soils to grow feed and thereby reduce the expenditures for purchased feeds. More than 200 records in the lowest income group show an average gross earning per farm of approximately $1,700. Their feed costs

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were 33 per cent of this total, carefully distributed farm expenditure. Only the small sum of 4 per cent of the farm expenditures went to buy limestone, fertilizers and seed as helps to their soils by which the yield of feed as tonnage per acre, as quality in milk production, and as size of calf crops could be improved. The economics of buying and delivering feed, out-weighed the agronomics of growing it right on the farm where the cows themselves could carry out the feed-hauling operation. The economics of buying feed occupied the scene so prominently that it disturbed the business unfavorably when, on the other hand, the agronomics as better production might have given security.

A similar number of farms had incomes in a higher bracket averaging $3,000 each. The better success of these in paying off their loans more regularly, said Mr. Martin, goes back to the fact that they needed to purchase feed to the extent of only 24 per cent of their farm income. This reduction in relative outlay for feed was brought about by an expenditure for limestone, fertilizers and seed to the extent of 6 instead of 4 per cent of the farm expense. For an investment of an amount equivalent to the prevailing rate of interest on their income and expense figure they were making a success of their venture in borrowing money from the Farm Security Administration to run the farm. By spending but 2 per cent more of their income than was spent by the group with the lower income of $1,700, they were reducing their feed costs by 9 per cent.

For the group with the highest incomes, reaching a figure more than double that of the second group, the feed expenses were approximately 18 per cent of the total annual farm operations costs. These folks were using 8 per cent of their expenses as a means of purchasing soil fertility, which served to grow the feeds on the farm. Here the agronomics of high order reduced the economics of feed purchases to put this phase of the farm business, too, in a very favorable position.

It is significant to notice that the highest total incomes were connected with the highest relative expenditures for the agronomic phase, namely, for the production of the better crops through the use of more soil fertility as a means of getting sunshine, air, and water to run the great chemical industry out-of-doors that we call "farming" in the true sense. Here there was real farming with its consequent production of foods and the provision of security for the family. The lowest total income resulted

where the expenditure was relatively the lowest in support of the soil through added fertility. Here there was not enough help to the soil that must be the basis of production of feeds and of foods.

When these figures are handled in their absolute values, rather than in percentages, they reflect the fact much better, namely, that good living on the farm comes mainly by good soil—and by one being good to it. The part of the income to be spent on the living proper of the family tells a significant story. Those families with a mean gross income of $1,700 per year had only $459 or approximately $100 per person to use for all phases of family living —food, clothes, education, recreation, medical care, etc. This amount does not support the standard of living thought of in connection with the "American way of life."

By increasing those expenses which produce feed from 4% of the gross incomes to 8%, as in the case of the most successful group, and assuming the level of production would remain constant we would expect to see the following changes in the operation. Economically the expenses for producing feed would be increased by $68. Agronomically the supply of feed would be increased in the amount of $204 (following the safe rule that $1 spent for plant food produces $3 worth of feed). By having produced this additional feed, $204 of income is released from feed purchases to other use. The first $68 would be used to buy the plant food for the next crop to keep the economic-agronomic cycle in balance and $136 could be used for those expenses that improve standards of living. Thus the standard of living can go up 30 per cent as registered by a shift of only 4 per cent in the economics of farming, but it is brought on by a shift in the agronomics of this business. The economics register what the agronomics bring about.

Surely this is evidence enough by which we can understand why the living standard can't go up on the farm unless the agronomic powers of the farm, namely, its soil fertility and its producing power, are high.

Security of investments in land demands good, or fertile soil. The earning power depends on how well that soil can continue to produce. The soil can't hold on forever without having some fertility turned back to it.

That fertility going back regularly must become a part of the economics of farming in support of the agronomics of it. Cost of production must consider the cost of the restored raw materials, namely, the limestone and other fertilizers that must go back to

keep that land productive. Farming will be secure only when that soil and its assembly lines delivering fertility are maintained at high delivery levels. We can't be secure in buying feed, or in moving the fertility as feed from some other form. We can't get security by robbing Peter to pay Paul. The study of Mr. Martin is telling us that security in farming is based on agronomics more than on economics. The soil is the basic support of the farm. Our farm security rests in its fertility and how wisely we manage and maintain it.

# Broiler Qualities

**Condensed from Everybodys Poultry Magazine**

***John H. Vondell***

Now that broiler raising is a big industry—here to stay—growers will find that the breeds, strains, and crosses likely to be most profitable will have these qualities:

Rapid growth—a 3-pound average, or better, at 12 weeks.

Fast feather growth—complete at 8 weeks of age.

Feed economy—a pound of growth for about 3½ pounds of feed.

Dressed grade—a high percentage that will grade out "A."

Uniformity—no runts, but evenness in size.

Comb height—fairly rapid growth.

Good pigment—bright yellow skin and shanks.

At Massachusetts State College four different strains ate 13.39 to 13.76 pounds of feed per bird during 13 weeks. One strain, however, produced a pound of growth on 3.53 pounds of feed, while another required 4.01 pounds of feed per pound of meat. This difference affects profits.

Some strains already combine high egg production with these broiler qualities. In other instances, careful crossing of egg-bred lines with special quality broiler stock may be desirable.

**Reprinted by permission from Everybodys Poultry Magazine, Hanover, Pa., Nov., 1946**

# Responsibilities of Co-operatives

**Condensed from California Cultivator**

*G. F. Henning*
**Ohio Experiment Station**

CO-OPERATIVES have real responsibilities if they are to fulfill their real opportunities. Their records should be open to the members and patrons. They should be more than just business corporations, almost those of a quasi-public nature. Some may disagree with this point of view but, unless co-operatives do this and rise to their responsibilities, they are little different from business corporations. If farmers want business corporations then they should so organize and be treated as such. It is one thing to be a co-operative and it is quite another to be a farmer-controlled and farmer-owned business corporation. Farmers and co-operative members must realize and know this distinction. Co-operatives have granted to them certain privileges, but that also means they have definite responsibilities, business as well as moral.

A recent study made by the Ohio agricultural experiment station of farm co-operatives in five Ohio counties examined the basic principles under which they are operating. Some of the important principles found in this study are set forth in this article.

*Membership should be open to all agricultural producers.*—When a member becomes inactive, his interest or equity in the co-operative should be returned to him at a time convenient to the co-operative. Recent research studies in Ohio have shown that farmers want co-operatives to make it easy for an eligible non-member to become a member. Too many co-operatives put all the responsibility on the non-member, with the result that there is a large volume of non-member business. This is an unhealthy situation.

*Voting should be democratic.*—It has long been the standard rule that each member should have only one vote. A freer use of the ballot is essential, since too many co-operatives now vote by acclamation. All important questions that are voted on by the membership or by delegates, should be decided by ballot. Especially is this true in the selection of directors. Unless ballots are used, individual members often fail to vote as they think best because they do not want

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their neighbors to know how they voted. Furthermore, there should always be two or more candidates for every director to be elected. These candidates can be nominated by the members by ballot before the annual meeting; or a nominating committee outside of the board of directors can select a slate of candidates; or a combination of the two methods can be used. One of the worst ways to hold an election is to vote by acclamation to re-elect the old board of directors.

*To uphold the moral responsibilities of the co-operative the directorship should be passed around.*—To do this there should be a by-law providing for the rotation of directors. This means that one individual could be contiuously re-elected a director only for a certain period—eight or nine years for example. This director would then become ineligible for a definite period, such as two or three years. In the meantime, a new member would be chosen as director and new ideas would be brought to the board. The old director could be re-elected after serving the period of ineligiblity if the members then desired. Some may say that a good man is lost to the organization. This is not necessarily true. If there is a good and capable man, then that man can be employed full time as an employee or part time as a consultant or advisor; in this way his services will not be lost. This provision for rotating directors will prevent many unfortunate situations from developing and keep "cliques" from controlling the co-operatives.

This requirement is particularly helpful in the larger co-operatives where there is a tendency for the directors and management to feel that they own and, therefore, should control the association. Co-operatives must be kept democratic and fully responsible to their members.

*The election of officers of co-operatives should have some attention.*—Directors of co-operatives organized under the co-operative marketing law usually select their officers from their own number. In such co-operatives every director should be considered as nominated for president,or for any other office. Then the directors should vote by ballot until one receives a majority. If more than one ballot is needed, the names of the directors receiving the smallest number of votes may be dropped after each ballot until one does receive a majority. The one receiving the second highest number of votes should be vice-president. Other officers should be selected in a similar democratic manner.

*Every member should receive an annual statement concerning*

*his co-operative.* —He should be told how one becomes a member. A recent study showed that 40 per cent of the members of one co-operative did not know they were members. Each year, every member should receive a report, which should give (a) an adequate statement of what has been done, (b) the financial condition of the co-operative (balance sheet and income and expense statement), (c) a statement of each member's share of the patronage dividends (if any) for the current year and the total dividends of previous years that may be held in reserve, and (d) an invitation to attend the annual or district meetings, as well as other pertinent information. Some will say this is expensive; however, this is the responsibility co-operatives assume when they organize. If they do not desire to fulfill these obligations, they should not seek the privileges of the co-operative law but should organize under the corporation act as a regular corporation instead.

*Savings should be distributed according to patronage.*—This is one of the principal differences between co-operatives and other private or corporate enterprises. That is, if one patron does $100 and another $500 worth of business, or if one patron delivers 50 units of product and another 250 units, then the patron giving the co-operative $500 of business or 250 units of product has contributed five times as much toward the savings as the other patron. This is the patronage principle. At the present time, when co-operatives distribute their savings to all patrons they are exempt from the federal income tax.

However, some have failed in their responsibility as co-operatives. They declare their patronage dividends on the above principle but do not pay the dividends out to their patrons in cash. Instead they merely make allocations to the patrons and keep the record in the office. The savings are not paid out but held in reserve for the expansion of the co-operative. Legally this has qualified them for income tax exemption but no member or patron knows what his share is of the savings. This is a clear case of the co-operative not assuming its full responsibility.

If the co-operative desires to retain all savings for future expansion for a period of years, then a definite procedure should be followed. A majority of the farmers questioned in this study were in favor of keeping savings, or a large part of them, for the future growth and development of the co-operative movement. The procedure then is simple. Each patron annually should receive from the co-operative a

statement showing the patron's share in the savings for that year and his total savings retained from all previous years.

The co-operative may desire to issue stock to the patron or some other evidence of equity, such as a certificate of investment or equity. In non-stock associations the writer believes that a mere statement giving the savings for the current year and previous years is all that is needed.

From the study made in Ohio, farmers approve of this method and they feel that the management and directors of co-operatives should give them that information. This, of course, means adequate accounting as well as extra labor in keeping the records and furnishing the information. Private corporations that pay income tax do not need such an extensive record system, but the co-operative has this additional responsibility if it wishes to be income tax exempt.

Furthermore, a co-operative has the additional responsibility of paying back to the patrons and members at some time all the savings retained. This should always be done at death, and preferably before. This means that all savings would be returned after they had been retained for a certain period, such as 25, 15, or ten years. This is known as revolving the capital. The length of such a period would be determined by the board of directors, keeping in mind the best interests of the co-operative. This then would be carrying out the real responsibility a co-operative owes its patrons. Any co-operative that does not meet this requirement falls short of its real responsibility. Right now, many co-operatives have equities of deceased members on their books. These equities should be returned to deceased members' estates at the earliest opportunity.

*A co-operative also has the responsibility of upholding the practices of doing what is right for the community and of maintaining a program for good.*—If the co-operatives are to enjoy and retain the privileges now given them, they must be more than just another agency, a competing unit or a furnisher of services. They must give and do more for their line of business or activity and they must constitute a movement for the good and betterment of the community.

Few people realize how much pasture a cow normally eats. The average cow giving 3.5 per cent milk needs 100 pounds of good pasture grass a day to produce 30 pounds of milk and maintain her body weight.

—*N. J. Farms & Garden*

# Father and Son Partnerships

**Condensed from The Western Farm Life**

*Raymond T. Burdick*

**Acting Head of the Division of Economics, Sociology and History at Colorado A & M College, Fort Collins, Colorado**

One of the important steps in the rapid adjustment to peace-time farming is to put the farmer and his son on a business basis in their dealings with each other. Many a farm boy will return to his home farm with wide experience and mature judgment. He will want to remain on the farm, but he will want to "know where he stands."

Successful farming requires full use of the business ability of the operators. Law and custom require that men make a record of their intentions, properly drawn up and legally signed, in order that both parties know what is expected of them and what they can expect.

The first essential of a father and son farming enterprise is that the farm be large enough and productive enough to support two families. A farm large enough to support the father alone will need either improvement in its production or increase in its size, if both father and son are to live comfortably on it.

Another important point in the success of the father-son farming enterprise is the question of where the father and son will live. A house is made for a family to live in. It is not made for two families to live in. It is essential that a definite and satisfactory solution to the housing problem be a part of the father-son contract.

There are several methods of operation of the farm for the father and son. Each farm will have its own peculiar conditions which need attention, yet there are certain basic methods of operation which can be used in the development of a father-son agreement.

## Contract No. 1

In one type of contract, the son has no investment in the farm and wishes to supply his own labor and management ability. In this case the expense of the operations will remain a heavy charge upon the father, who can either guarantee the son a minimum wage and some percentage of the yearly net cash income, or can include in his final settlement, a share of the values shown in the farm inventory change.

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### Contract No. 2

A second type of agreement may be made where the son has some investment or wishes to assume some share of the investment. This can be limited to the investment in equipment and livestock, or it can include some of the investment in real estate. This means that the son should share in paying certain farm expenses and receive a larger share of the receipts. Various methods have been used successfully.

At first the son may own one fourth of the personal property, pay one fourth the cash farm expenses — other than real estate taxes and irrigation water—and receive one fourth of the farm receipts other than from winter fattening of lambs or cattle. These feedlot operations can best be treated separately, with all expenses and receipts shared equally. As the son improves in financial condition, he may take over the entire investment in livestock and machinery and lease the farm from his father.

### Contract No. 3

Another variation of this same type of contract is where the father and son decide to own livestock and equipment on a 50-50 basis. In this case they will share all cash expenses equally and share all receipts equally. In a contract of this kind the amount of work done by the father must be considered, as it may vary from little or none, to full year-long work. The agreement should include basic rates of pay for such work to be considered as part of the farming expense to be used in making the final settlement.

The third type of agreement may be worked out where the son wishes to buy the farm and become an independent farmer. In this case the farmer may consider his ultimate intentions before disposal of the property. If finally a share of his farm would go to the son, then in the agreement-for-sale, some provision should be made for this detail. For example, let us assume that the son's final share of this farm would be one-fourth. Then the father could accept this one-fourth as "down-payment" and sell the farm on a long-time, low-interest-rate amortization method of payment. Or they could secure such a loan from some credit agency and the father and son could make a contract covering any final amounts due, if such remain, after the credit loan has been completed.

These suggestions for father-son farming agreements are based on actual farm records and various possible divisions of responsibility. A little careful consideration and attention to getting the agreement in writing and making

it specific, will go a long way in getting the young farmer established and keeping him on the farm.

It must be assumed that both father and son are interested in farming and that they seek a satisfactory method for a working agreement between them. Beyond these two conditions it must also be assumed that the United States is a going concern and that farming done according to business principles — with alert management ready to adjust to changed conditions — will be successful over the long pull. There is no need for a business agreement if leisure or havens of retirement are the major ends in view.

# Tub Bottom Farming

**Condensed from Capper's Farmer**

AGAINST the national trend toward marginal land, which means marginal income and marginal living, Missourians are erecting a bulwark of individual farm and home management. The movement is committed to promoting the greatest return compatible with reasonable soil fertility preservation. It is predicted upon the theory that if every farm is operated to best advantage, so that every family realizes the maximum possibilities that their land affords, greater economic stabilization of agriculture will be effected.

Its horse-and-buggy name, "Balanced Farming," suggests the grass roots objectives. Each farmer works out a production program that will maximize his long-time income. In so doing he lays out a stable, conservative system of farming adapted to his conditions and his needs. That requires a series of balances between and among the resources of his business. More than 4,000 Missouri families already have adopted such programs.

In establishing the system, the individual farmer follows a definite formula:

ONE—He balances land use with land capacity or capabilities. That involves determining to what crops each part of his farm is adapted, and the intensity with which it can be worked. How often, for instance, should it produce row crops and small grains, and how long should it remain in

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sods? Then he outlines rotations for each class of land with an adequate supply of pasture in each.

Two—He balances fertility input with fertility outgo. Only by that means can crop yields be maintained or increased. A working surplus of organic matter, calcium, phosphorus, nitrogen, potash and perhaps other elements, is required. That means soil treatments to raise the levels; erosion control to minimize mechanical losses and to conserve water.

Three—He balances livestock enterprises with the pasture available or that can be developed. But each balance is preferably struck on an optimum rather than a low stocking. That will, in most cases, require building pastures rather than reducing animal units. Liming, phosphating, manuring, reseeding and weed control will increase the carrying capacity of permanent sods or of rotation pastures but these must be supplemented with lespedesa, Sudan and small grains. The system requires a stable supply of grass from April to November.

Four—He balances harvested feed with livestock needs. The cropping program is designed to produce all the cured roughage and as much as possible of the grain required. Relation between roughage and pasturage is his guide. The hay and fodder should be ample during no-grazing months to feed all livestock he carries under the pasture system. The program does not contemplate that he shall ruin his land in an effort to grow grain. If necessary he will buy what he requires beyond that which can be produced in the safe cropping system, or adapt meat and milk production largely to a grass and roughage basis.

Five—He balances labor needs and labor supply. That may determine whether he goes into dairying or chicken raising, or into beef cattle, sheep or hogs. Likewise the labor situation may dictate, if his soil offers a choice, whether he will produce high labor or low labor crops, and these in turn may affect his choice of livestock projects.

Six—He balances equipment needs with requirements for the type of production undertaken. Machinery, buildings, fencing, field and farmstead layout can save labor and facilitate production. They must be adequate but not a capital burden.

Seven—He establishes a sensible balance between income and outgo. Without such precaution, human experience indicates expenditures are prone to exceed income. The balance does not contemplate that a family shall spend all it makes, but rather

that it shall at least not spend more than it makes. No farmer can remain interested very long in a system of farming that doesn't make him an adequate living. Financial records of both farm and home operations will be necessary in maintaining this balance.

None of these balances can be effected independently of the others, so that collectively they constitute a farm production program.

"The primary objective of the movement," said J. E. Crosby, Missouri Extension Service, "is to make farming more attractive and enable farm families to enjoy more comforts and conveniences —to promote a higher standard of living. Altho it is called Balanced Farming, the home and household are necessarily included."

Balanced Farming offers no quick, easy path to the desired goal. Establishing it requires sound sense and hard thinking. Carrying it out requires time and determination. Yet its functioning is remarkably simple. After all the factors which go into good farming are put together, they operate automatically to offset the hazards of day-by-day management and the errors of hand-to-mouth judgment.

To many the movement offers little. They are the farmers who already are consciously or unconsciously following its principles. But to the mass producers, it offers much. A self-imposed test will reveal its potentialities for each individual. If his operations provide reasonably adequate long-time income to meet family requirements for better living without robbing the soil, then there will be no object in changing his production program.

Balanced Farming got under way without fanfare and without benevolence of uplift. Its origin and its name expresses little faith in the magic of hat-spawned rabbits, but rather suggests adherence to the grandpa philosophy that every tub shall stand on its own bottom. A few farmers in scattered communities thruout the state put the proved practices of good farming together into a balanced program. These developed into over-the-fence demonstrations when the evidence of higher income — better-kept farms, improved homes, more comforts and conveniences—became apparent. In many cases this evidence evolved, surprisingly, out of farms that had been considered nonproductive.

# Food Value of Rabbit Meat

Condensed from The Michigan Farmer

*D. B. Darling and H. W. Nilson*

United States Department of the Interior, Fish and Wildlife Service

Domestic rabbits are becoming more important each day in supplying meat in homes and restaurants. It is not seasonable but can be served throughout the year. Many people, however, do not believe the domestic rabbit meat has as much food value as pork, lamb, or beef so they are hesitant about learning to prepare and serve it during regular meals.

In order to obtain reliable information on the comparative value of rabbit and beef the U. S. Fish and Wildlife Service shipped frozen domestic rabbit meat from the rabbit experiment station at Fontana, California, to the technological laboratory at College Park, Maryland, for cooking and testing purposes.

The rabbit carcasses were thawed and roasted for 30 minutes per pound at 325° F. Locally purchased beef was roasted at 325° to an internal temperature of 165° F. The meat was then stripped from the bones, ground, mixed thoroughly, formed into blocks and held frozen until used for feeding tests.

The proximate analysis of the edible portion of the roasted meat showed that the cooked meats from the 2 sources are very similar in overall food value. The rabbit meat was found to contain .10 milligram thiamine, and .12 milligram riboflavin per 100 grams as compared with values reported for beef of .11 milligram thiamine and .20 milligram riboflavin. Both the proximate analyses and vitamin values of course vary somewhat from sample to sample but in general the 2 meats are quite comparable.

Feeding tests with weanling rats were used for a study of the comparative nutritive value of the protein of the two meats. These were fed unlimited quantities of a diet containing all food elements,except protein, needed for good growth. The rabbit meat and beef were fed daily to each rat in quantities so limited that the total food contained about 10% meat protein. Each rat received about 56 grams animal protein during the 8 week feeding period. The gain in live weight under these conditions is approxi-

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mately proportional to the nutritive value of the protein.

It was found that the rats fed rabbit meat had gained an average of 126 grams each during the 8 week period while those fed beef gained 119 grams each. The difference is within experimental error, and the data show that rabbit meat is about equal to beef as a source of protein.

During the eighth week on test, feces were collected, and analysed for protein. Since the amount of food eaten was known, the apparent digestibility of the protein could be determined. It was found that the rabbit meat protein was about 96% digestible while that of beef was 93% digestible. These data show no significant differences.

In conclusion, it can be stated that rabbit meat is a good quality animal protein that is well digested.

# Mulch Farming Checks Erosion

**Condensed from Southern Agriculturist**

*A. B. Bryan*
**Agricultural Extension Editor, South Carolina**

It is an axiom that permanent high production on sloping land can not be achieved without controlling soil erosion. That is the basis for recent studies in the use of organic matter to control erosion, conducted by the South Carolina Agricultural Experiment Station and Soil Conservation Service of the U. S. Department of Agriculture at Clemson, South Carolina.

These experiments prove conclusively that organic matter left on the soil surface is much more effective in controlling erosion than if it is plowed under or otherwise incorporated in the soil.

Planting and cultivating machinery in general use has been designed to operate on the established practices of plowing to turn under vegetation and to control weed growth. Hence there is not much equipment available for mulch farming, and the South Carolina investigators had to devise suitable implements as well as mulch culture techniques.

Tillage tests with corn in which the effects of maintaining the residue from winter cover crops on the soil surface as a mulch during the growth of corn were compared with treatments in which the cover crops were either disked in or plowed under. All cultural operations were per-

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formed with tractor equipment.

When disking and plowing methods were followed, the usual clean cultivation procedures were used in cultivating the corn. Where mulch farming methods were practiced, furrows were opened by means of reversed disk-hillers and corn was planted in the furrows. The areas between the rows were plowed with a sweep-type tillage implement designed to leave all of the plant litter on the surface of the ground.

The yields of corn were significantly higher where the mulch treatment was used than where the cover crop residue was plowed under, while the disked treatment, which left some residue on the surface, resulted in yields intermediate between those of the other treatments.

Rainfall from April to September, 1944, was 20 to 50 per cent below normal each month. The only storm during the corn-growing season occurred on August 17. It resulted in considerable erosion and the run-off and the data from it showed that the mulch method was much more effective than any of the other tillage treatments in controlling run-off and erosion.

Two methods of planting oats following Kobe lespedeza were tested in these trials. One method consisted of disking the lespedeza stubble thoroughly and drilling the oats with an ordinary grain drill. The other method consisted of drilling the oats directly in the lespedeza stubble, using a deep furrow or lister drill with no ground preparation. This method left a balk of lespedeza stubble between each two rows of oats, and the oats were placed in a deeper furrow than they are with the ordinary drill. The combined effects of the lespedeza litter and the deep furrows provided much better erosion control than the ordinary method of planting and, of course, resulted in a very considerable saving in labor since the disking operations were eliminated.

A new type of two-row mulch plow was developed during 1944 for use in plowing the areas between cotton and corn rows. It effectively controls weed growth and leaves the plant litter on the surface. It can also be used for killing the growth of winter cover crops in balks between cotton and corn rows. The implement consists of four peanut digger blades attached to a cultivator assembly. The blades have been cut off to a convenient length which allows each blade to cultivate slightly more than half of a middle. Spacers are used for holding the blades the desired distance apart and a gauge wheel with each blade controls the depth of penetration.

# Eight Months of Pasture

**Condensed from New Jersey Farm and Garden**

***H. R. Cox***

THE old saying that the cheapest milk is made on pasture has been amply proved and cannot be emphasized too strongly. Although the theoretical pasture season in New Jersey is about six months, actually there is good grazing for considerably less than that length of time on most farms. To stretch the pasture season to eight months, therefore, and provide good grazing most of the time, sounds like a fairy tale. A number of dairymen in the state have come close to that objective, however, and their feed costs are below average.

After watching the pasture management practices on many New Jersey farms over a period of years I am impressed with a point which is not generally recognized. The pasture problem is largely an individual one. The best plan for one man may not be the best for his neighbor.

The most favorable pasture program for a certain farm must be determined by a number of conditions—the character of the soil, the amount of land available for pasture, the rotation followed on the tillable land, the desires, financial status and abilities of the farmer himself.

In other words, there is no such thing as an average New Jersey dairy farm, so far as the pasture resources are concerned. I do not believe, therefore, that every farmer would find it practicable to provide eight months of grazing. But many New Jersey dairymen can do so, and the observations which follow show how an eight-month pasture program can be worked out.

A large part of the grazing on most livestock farms is provided by the permanent pasture consisting essentially of Kentucky bluegrass and white clover. These sods make abundant growth in the flush period of May and June, go into a dormant condition during July and August, and stage moderate recovery in September. One difficulty with these pastures, therefore, is that they are usually unproductive during the summer season. This drawback can only be partially corrected by top-dressings with fertilizer or manure. It is the nature of bluegrass to go into a long dormant period during the summer, although in a moist season like this year these sods have held up better than they usually do. These bluegrass sods also do better on lowland

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areas that hold their soil moisture than they do on upland soils.

Most dairy farms have fields that are better adapted to these permanent pastures than to any other crop, either because they are too low or wet or too hilly or stony for cultivation. The grower's problem then is to get the most he can from these permanent pastures. It has been repeatedly shown that the application of lime to correct soil acidity and the judicious use of manure and fertilizer to furnish plant nutrients will greatly increase the productivity of these sods.

A good method of topdressing permanent pastures is to apply from 400 to 700 pounds per acre of a mixed fertilizer, such as 5-10-5 or 7-7-7. If a fairly large acreage of pasture receives this treatment in one season, it is well to apply the fertilizer to several areas at two-week intervals beginning in early March in order to spread the peak of the pasture production over a long period. The first treatment may even be made in early fall, between the time grass growth ceases and the ground freezes. Manure supplemented with superphosphate may be used as a substitute for this type of general pasture improvement.

Another method of treating permanent pastures which is widely useful is to apply about 1,000 pounds per acre of one of these high nitrogen mixed fertilizers to a small area of good pasture sod on well-drained land, about one acre to six cows, primarily to provide early spring grazing. Sods so treated may be turned on 10 to 15 days earlier than on untreated pastures. This early grazing will nearly always show a good profit above the cost of barn feeding in that period, and the phosphate and potash materials in the fertilizer will exert a beneficial effect on the sod for several years afterward. As a substitute for this heavy application of mixed fertilizer, 300 pounds of nitrate of soda or 150 pounds of ammonium nitrate per acre will be an even more economical treatment, provided the needs of the soil for phosphate and potash fertilizer have been adequately supplied.

All permanent pasture testing below pH 6.0 should receive an application of lime. It is always desirable to follow rotational grazing on these sods and to mow them at least once a year.

A type of grass sod which will furnish a great deal more grazing than bluegrass during the difficult summer period is one consisting of a mixture of such a grass as orchard grass, smooth brome or reed canary in combination with Ladino clover or alfalfa. Such sods are approximately twice as

productive as bluegrass under the same soil conditions. Frequently the best plan of management of these sods is to mow the first growth of the season for hay or grass silage, then pasture during the summer. Since seedings of this kind are well adapted to all three purposes they have been referred to as multiple-purpose sods.

Strictly for grazing a combination of orchard grass and Ladino clover is hard to beat, if the peculiar habit of early growth of orchard grass is met by early grazing or mowing. Smooth brome grass, to, is highly useful, especially as a combination mowing crop and summer pasture crop. The southern strains of brome are best suited to New Jersey, and the prospective grower should study seeding methods of this grass before he starts a field. Reed canary grass has a place on the low moist soils, epecially in combination with Ladino clover. These multiple-purpose sods responded remarkably well to the liberal use of high phosphate and potash fertilizers, and to lime if needed.

Another means of supplementing permanent bluegrass pasture during the summer is to plant one or more fields of Sudan grass. This annual grass delights in hot weather and furnishes a lot of good grazing at a time it is much needed. Since this crop has to be sown every year, Sudan grass pasture is more expensive than the permanent or semi-permanent pasture crops previously discussed. On many farms, however, it is cheaper to graze Sudan grass than to feed hay during the summer.

These various types of pastures, with a certain amount of grazing on crop land—hay fields after mowing or young seedings in grain stubble—should be ample to carry the herd during the normal pasture season of six months. How is it possible then to stretch the pasture season to eight months? This may be done by planting small grain for grazing purposes. Wheat, rye or winter barley can be quite useful for supplementary pasture. If these crops are to be used exclusively for grazing they may be sown early, say in late August or in September, and thus provide pasturage in October and November. These winter grains can also be made to furnish early spring grazing nearly a month before cows are turned on grass pasture. If sown at the normal time for winter grain they will furnish pasture only in the early spring. Winter grain may either be pastured rather lightly for a brief period and then allowed to come on for grain harvest, or the crop can be completely grazed off.

Pastured winter grain is a

more favorable companion crop for clover and grass seedings than unpastured grain, provided the animals are kept off the field when the soil is quite wet. The grass seed is sown in the fall at time of grain seeding and the clover or alfalfa is broadcast on the grain in March. Instead of seeding to a grass-clover combination, some growers might find it useful to sow some domestic rye grass alone at time of sowing the winter grain. This grass will provide a sod quickly, to furnish some spring grazing after the winter grain is pastured off. Sowing rye grass with winter grain would be most useful where the field is to be planted next year to a late crop, such as corn or soybeans.

Still another source of late fall pasture is the topgrowth or hay on pasture fields. Some growers pasture these fields too closely in September and October, when the plants are completing their growth for the year and are trying to renew their root reserves for the next season. After growth for the year is complete, however, that is after November 1, there is no objection to grazing the grass, clover, and alfalfa tops.

# To Get More Winter Eggs

**Condensed from American Poultry Journal**

*Willard C. Thompson*
**New Jersey**

Two things are essential for profitable egg production: a high average egg yield per bird, and keeping a high percentage of the birds selected in the fall for the laying flocks alive and laying over the whole year. To do this, breeding, of course, plays a very important role, but environment and management will undoubtedly bring out of the average hen a far greater egg yield than is ordinarily secured.

Pullets come in from the growing ranges, at near the ready-to-lay stage, in as strong, robust, and vigorous health as they will ever enjoy. Poultrymen should endeavor to capitalize on that natural endowment by mapping out a management program which will not tend to destroy or break down that splendid strength and store of energy and health.

First let us suggest that comfort is a prime essential. Hens

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will not long remain in good health, if their environment is continually damp, chilly, drafty, and uncomfortable. Neither will hens continue to keep up sustained high rate of egg yields, unless they are comfortable. Temerature is the most significant element in insuring comfort of poultry housing environment.

The winter poultry house must keep the hens warm enough to induce them to exercise normally, eat ravenously, drink water freely, and exercise willingly and happily. Many of the wintertime poultry laying houses are too cold. I mean, too cold down there on the lower foot of air space just above the floor, or litter, down in that part of the house in which the hens live and work during lighted hours. Look well to the temperature conditions in that part of the house.

Prevention of floor drafts will help a lot by repairing cracks in walls through which chill winds may creep in wintertime. Use of about 6 inches of warming, dry litter is bound to keep the floor area more comfortable. Most poultry house floors are apt to be cold, hard, damp, unless protected by an absorbent, sanitary, insulating litter. Let the sunlight in through clean, glass windows (many poultrymen like to use glass substitute windows or windows made of special glass permitting the ultra-violet rays to enter, instead of ordinary glass); the heat rays will help to keep the floor dry, clean and comfortable.

Another help, in providing warmth in the winter laying house, is to use insulation on the inside of the frame work of the house, both on the ceilings and the side walls—double protection against wintry blasts outside. It is amazing how much more comfortable a well insulated laying house can be. This same treatment will also help keep the same house cool next summer. The well-constructed walls and ceilings of a laying house will tend to keep outside cold outside—and to use the warming effect of an accumulated warm air blanket which will form in the upper parts of the room, if chance is given.

Second, fresh air is constantly needed, if many hens are kept together in a flock. Used air must be continuously moved out, and oxygen-laden air made available to working fowls. This means ventilation—but without direct drafts. Because most poultry houses have more head room, really, than the hens need, relatively small ventilation openings, during winter time, are needed. Most poultrymen insist on too much air movement. This cools off the interior of the house, and

that is an undesirable loss of needed warmth. Some air movement is needed to help keep litter dry, of course. Air movement within the winter laying house should always be under control. Often it is not, and then trouble results.

Third, space is needed by the hens. We suggest that 3 sq. ft. of floor area per pullet when housed in the fall is enough; and such allotment, less than we have heretofore advocated, permits of housing more hens in a given building than may have been done before. The flock will gradually be reduced by normal mortality and culling as the year proceeds, thereby increasing the floor space per bird. Figure on males as well as hens where eggs are saved for hatching; and do not violate this space allowance!

Fourth, encouragement to consume even more feed must be given to every flock. This includes, (1) furnishing at least one 6-ft. mash hopper, usable from both sides, for every 25 hens, locating each hopper in the center of the pen, easily accessible to the hens. Provide each hopper with easy, comfortable side perches, and put the hopper up on 18 inch legs, to help keep the feed clean. (2) Also furnish some new, fresh mash daily; and make it a practice to stir the mash surface up a bit each time you make a trip through the pens. Try sprinkling a bit of clean water over the surface of the dry mash near noon time—it will usually induce immediate new interest in mash consumption. (3) Do not fill any hopper more than ¾ full at any one time—prevent waste, if possible.

Naturally, a good, well-balanced ration is a primary requirement for high egg production.

The daily routine of flock management should be similar and as nearly unbroken as possible, for hens are creatures of habit. They respond best to uniform, even management. A regular 13-hour lighted day in winter time, made possible through use of artificial lights during the colder months, is part of the recipe for good flock management.

There isn't much that's new in layer management, but it is important that everyone try to keep his layers just a little more comfortable and happy than may have been attained last year, in order that this winter's egg yields may be higher, and mortality losses held to lower figures. Give the layers every break that management, feeding, and housing can provide. A few more eggs per hen will more than repay costs. A few more hens kept alive and laying may spell the difference between profit and losses.

# Finishing Steers in the Feed Lot

Condensed from The Southern Planter

*L. I. Case*

North Carolina State College

THE two main objects of fattening cattle are the marketing of crops and the production of manure for soil building. The successful cattle feeder usually fattens about the same number of cattle each year, although this may vary with the season and amount of feed produced.

The length of the feeding period should vary with the age and quality of the cattle, their condition when started on feed, the kinds and amounts of feed fed, and the market. As a rule, the more mature the cattle the quicker they will finish because less nutrients are required for growth. It generally takes 200 to 250 days for fattening calves, 150 to 200 days for yearlings and 120 to 150 days for two-year-olds, to put on a good to choice finish.

It will pay better to carry the higher grades of cattle over a long feeding period than it will the lower grades because our central markets are willing to pay for extra finish on the better grades of cattle. It goes without saying that the higher the condition of the cattle at the beginning of the feeding period, the shorter the time required for finishing.

Cattle purchased in the fall for winter feeding may be turned on corn stalks, soybean stalks, or pasture upon their arrival on the farm. This will not only utilize feed that might otherwise be wasted but it gives the cattle a chance to recover from their trip to the farm. They may well be carried under such conditions from 1 to 3 weeks but should be put into the feed lot before they stop making good gains.

Opinions differ as to the proper length of time required to get cattle on full feed. However, it should generally vary with the length of the feeding period. Cattle that are to be short-fed should be gotten on full feed in about 3 weeks, while 4 to 5 weeks or more may well be taken with cattle that are to be fed for longer periods.

Following are some general suggestions for getting cattle on feed, but it should be remembered that the successful feeder

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always watches and studies his cattle and varies his methods to fit his individual case.

1. Feed a large amount of roughage at first and a small amount of grain or other concentrates, cutting down the amount of roughage as the concentrates are increased.

2. If a protein supplement such as cottonseed meal or soybean meal is to be fed in an amount not to exceed 3 pounds, it is all right to feed this amount from the start. Where larger amounts are to be fed it should be increased gradually.

3. Method of getting 2-year-old cattle on feed: Feed all the roughage they will take. Start with 2 to 3 pounds of cottonseed meal and 2 pounds of shelled corn or the equivalent per steer daily. Increase corn 1 pound per steer daily until they are receiving 10 to 12 pounds. Then increase corn gradually 2 pounds for each 5 days, until cattle are getting all they will clean up.

Too much emphasis cannot be placed on the value of ample bedding in the feed lot. Cattle that are well bedded not only make better use of their feed but, due to their clean appearance, usually sell better when they are ready for market. Furthermore, plenty of bedding conserves much manure that would otherwise be wasted. This in itself is justification for the use of large quantities. Grain straws and shredded corn stover are the most common bedding materials used.

Regularity of feeding is about as important as the kind of feed. If, for example, the cattle are to be fed at 7 o'clock in the morning and at 6 o'clock at night, feed at these times every day.

Be gentle, quiet and patient with cattle. They will make better use of their feed if they are unafraid of their feeder.

Avoid radical changes in amounts or kinds of feed. Any changes should be made gradually and, as a general rule, any change should be for the better. For example, cattle may be started on broken ear corn, and later changed to corn and cob meal and finished up on shelled corn, while a change from shelled corn to broken ear corn would not be advisable.

Watch the cattle and the feed bunks. Be on the watch for cattle that may be off feed for one reason or another. If any feed is left from one feeding period to the next, clean it out and give it to the hogs or breeding cattle. Keep the appetites clean. If the cattle go off feed cut the amount of feed down, then as their appetites come back, gradually increase it.

Do not try to force the cattle to eat unreasonable amounts of

low grade roughage such as corn stover, straw, or cottonseed hulls. Beginners often have the idea that they can economize by inducing cattle to eat more roughage than they normally require. This may be all right for cattle that are being carried over but it is a mistake with cattle that are being fattened for market.

Corn is given as the main concentrate in the following rations but barley may be substituted for corn. Furthermore, the protein concentrate may be fed in larger amounts to replace part of the corn if the price is cheaper pound for pound. Cattle should be fed both concentrates and roughage twice daily at regular hours.

**400-POUND STEERS (Initial Weight)**

| Dry Rations | | Succulent Rations | |
|---|---|---|---|
| 1 | Lbs. | 1 | Lbs. |
| Corn | 12 | Corn | 10 |
| Protein meal | 1 | Protein meal | 1 |
| Legume hay | 6 | Legume hay | 4 |
| | | Silage | 10 |
| 2 | | 2 | |
| Corn | 10 | Corn | 10 |
| Protein meal | 2 | Protein meal | 1¾ |
| Mixed hay | At will | Mixed hay | At will |
| | | Silage | 10 |
| 3 | | 3 | |
| Corn | 12 | Corn | 10 |
| Protein meal | 2 | Protein meal | 2 |
| Corn stover | At will | Corn stover | At will |
| | | Silage | 10 |

**600-POUND STEERS (Initial Weight)**

| Dry Rations | | Succulent Rations | |
|---|---|---|---|
| 1 | Lbs. | 1 | Lbs. |
| Corn | 14 | Corn | 12 |
| Protein meal | 1½ | Protein meal | 1½ |
| Legume hay | 6 | Legume hay | 5 |
| | | Silage | 12 |
| 2 | | 2 | |
| Corn | 13 | Corn | 12 |
| Protein meal | 2½ | Protein meal | 2½ |
| Mixed hay | At will | Mixed hay | At will |
| | | Silage | 12 |
| 3 | | 3 | |
| Corn | 13 | Corn | 10 |
| Protein meal | 2½ | Protein meal | 2½ |
| Corn stover | At will | Corn stover | At will |
| | | Silage | 20 |

**800-POUND STEERS (Initial Weight)**

| Dry Rations | | Succulent Rations | |
|---|---|---|---|
| 1 | Lbs. | 1 | Lbs. |
| Corn | 16 | Corn | 14 |
| Protein meal | 2 | Protein meal | 2 |
| Legume hay | 7 | Legume hay | 5 |
| | | Silage | 15 |
| 2 | | 2 | |
| Corn | 15 | Corn | 14 |
| Protein meal | 2½ | Protein meal | 2½ |
| Mixed hay | At will | Mixed hay | At will |
| | | Silage | 14 |
| 3 | | 3 | |
| Corn | 15 | Corn | 12 |
| Protein meal | 3 | Protein meal | 2¾ |
| Corn stover | At will | Corn stover | At will |
| | | Silage | 25 |

**1,000-POUND STEERS (Initial Weight)**

| Dry Rations | | Succulent Rations | |
|---|---|---|---|
| 1 | Lbs. | 1 | Lbs. |
| Corn | 18 | Corn | 16 |
| Protein meal | 2½ | Protein meal | 2½ |
| Legume hay | 8 | Legume hay | 5 |
| | | Silage | 25 |
| 2 | | 2 | |
| Corn | 16 | Corn | 15 |
| Protein meal | 3 | Protein meal | 3 |
| Mixed hay | At will | Mixed hay | At will |
| | | Silage | 17 |
| 3 | | 3 | |
| Corn | 17 | Corn | 14 |
| Protein meal | 3½ | Protein meal | 3½ |
| Corn stover | At will | Corn stover | At will |
| | | Silage | 30 |

# "Built-in" Fire Prevention on Farms

**Condensed from Holstein-Friesian World**

FARMERS will spend millions of dollars in the next decade remodeling their homes and production plants or building new ones, and the National Fire Protection Association points the way toward intelligent planning which will make the farms of the future less vulnerable to the ravages of fire.

The NFPA, a technical non-profit organization with headquarters in Boston, has been crusading for fifty years to reduce the staggering fire losses in America. Each year it sponsors Fire Prevention Week as a means of calling attention to the tragic waste, much of which could be prevented because 85 per cent of farm fires are attributed to carelessness and improper construction of homes and farm buildings.

With wartime restrictions on remodeling and modernization relaxed by the War Production Board, and a vast volume of new construction soon to start, the NFPA appeals to enlightened self-interest in emphasizing the fact that fire-safety can be built into homes and farm buildings.

"Farm fires are the most destructive enemy of America's food production," declares Percy Bugbee, general manager of the National Fire Protection Association.

To back up his statement, Mr. Bugbee presents the following shocking statistics from the files of the NFPA:

In the last decade, $990,000,000 worth of valuable farm property has gone up in smoke in the United States, and 35,000 persons have perished in farm fires, most of which were caused by negligence.

Last year alone, according to Mr. Bugbee, fire destroyed $90,000,000 worth of property and killed 3,500 persons on farms. Voracious fire attacks farms at the rate of one every fifteen minutes.

The NFPA attributes fully 50 per cent of rural fire losses to faulty construction. With fire-safe material, proper spacing of buildings and reasonable precautions in eliminating the common causes of fire, the NFPA declares that thousands of lives and millions of dollars worth of valuable farm property and crops would be spared the torch of carelessness.

How can this millennium of safety be attained? The NFPA lists five cardinal principles of "built-in fire prevention."

(1) Make sure the heating plant is properly constructed and installed with adequate safe guards.

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(2) Insist on fire-retardant roofing, such as asphalt shingles or some similar protective covering, which will resist the flaming touch of windblown sparks and firebrands. Sparks from chimneys and bonfires landing on flammable wooden roofs stand third among the major causes of rural fires.

(3) Install a safe and adequate wiring system, with sufficient capacity and outlets to carry the heavy electrical load needed on modern farms.

(4) Make sure the chimney is soundly constructed of fire-safe material, with a strong masonry foundation resting on the ground and not on timbers.

(5) Protect all buildings with lightning rods.

Proper spacing of farm buildings, the NFPA points out, will be of greater importance in the future as a fire-preventive measure because of the increased use of electricity and power equipment and their concomitant fire danger. Only through adequate segregation can the threat of communicated fires be eliminated. When various farm buildings are so spaced as to be subject to one fire, NFPA warns, then the danger of the destruction of the entire plant is multiplied by the number of units.

The three principal considerations controlling the location of buildings are UTILITY, SAFETY and BEAUTY. All three are inter-related and can be attained easily by careful planning of the farm group, to make each unit safe from the other yet located to permit maximum efficiency. Beauty can be assured by thoughtful selection of a harmonious outside color scheme. This permits the roofs of all buildings to be covered with fire-resistant material of the same blended or solid color which will harmonize with the color and trim of the home to give the farmstead a distinctive appearance.

Fire safety and space utilization as recommended by the United States Department of Agriculture and the National Fire Protection Association, calls for the dwelling to be located at least 150 feet from the barn.The barn, if possible, should be in the opposite direction from prevailing winds. This protects the dwelling from barn fires and also from barn odors.

Other buildings, such as brooder houses, corn cribs and machinery sheds, should be spaced accordingly, at least 100 feet from the principal farm structures.

The NFPA also stresses daily alertness against common fire hazards. Many of these can be eliminated before remodeling begins to assure the greater protec-

tion during winter months when incidence of home fires rises sharply.

The usual hazards which exact such a heavy toll in lives and property are:

(1) Inadequate lightning rod protection; (2) defective, sooty chimneys and heating systems which spew out flying sparks that set fire to flammable wooden roofs; (3) careless use of matches which should never be discarded while lighted; (4) careless smoking habits, especially in the barn where loose hay is easily set afire; (5) negligence in handling and storing kerosene and gasoline used in power machinery; (6) spontaneous ignition of hay that was not properly cured before being stored in the mow, or was covered by a leaky roof which permitted the heating process to start; (7) misuse of electricity and failure to repair or replace worn or frayed electric cords; (8) accumulated rubbish which should be cleared out of the attic, basement, closets and garage.

# Chicken Tenderizer

**Condensed from Capper's Farmer**

A METHOD of producing capon tenderness and fatness, but preserving the characteristic flavor in fryers, has been worked out by R. George Jaap and associates at Oklahoma A. & M. College. It consists in giving the birds a female hormone of the estrogen group which induces fatting of the tissues. Jaap says the substance will fatten a growing chicken of any age. Normally birds do their growing, which requires 6 or 7 months, and then they begin to fill out. As an example he points out that the fattest fowl is a pullet just ready to lay.

Practical application of the method, he believes, will be in improving the quality of young meat birds. For instance, a boost in grade that is worth 2 or 3 or more cents a pound on the normal market may be quite possible for the cost of about one cent. It is quite difficult for the ordinary feeder to produce near top and top broiler grades. The hormone treatment, Jaap believes, will make such grades easier to attain, when and if the substance becomes plentifully available. Then young chickens may literally fry in their own fat.

The work at Oklahoma was inspired by tests in California in which pellets of diethylstilbestrol were implanted under the skin of old roosters to enforce "tenderizing." Dr. F. B. Hutt, Cornell University, recently announced an

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experiment which involved roosters 18 months to 4½ years old, and discovered the treatment resulted in an accumulation of fat in the skin, in the abdominal cavity and in the muscles. Cooking and eating tests proved the meat had thereby been rendered comparatively tender.

Oklahoma investigators, Jaap, Robert Penquite and R. H. Thayer, improved upon the method of administration. After trying several ways they settled upon feeding as the most practical and cheapest.

Diethylstilbestrol has been used in certain human treatments. A derivative of it used in the Oklahoma tests is more effective for chickens. But to date the substance or its use is not adaptable to barn-lot and scoop-shovel methods of compounding with feed.

Jaap thinks old cocks may be converted to the quality and tenderness of a fat hen. He reports roasting a 10-pound cock, that normally would have weighed 3 to 3½ pounds. Cooking required 2½ hours, "but," he said, "I never ate a juicier chicken. However, the treatment does not get rid of the tendons which, of course, are pronounced in a bird that age."

The normal market spread between old hen and rooster prices is large and reflects the difference in quality. There is thus much, proportionately, to be gained in improving rooster carcass quality. But most poultrymen will have few roosters to tenderize compared with younger chickens.

## New Timothy

Two new timothy varieties have been recommended in Minnesota for hay. One is Itasca, a synthetic kind introduced at the Minnesota station, where it was developed by combining six inbred lines, one from Minnesota commercial seed, two from Cornell No. 1620, and three from Cornell No. 1777. Itasca is superior to commercial timothy in hay yield and about equal to it in seed production and date of maturity. It has been distributed to growers of pure seed.

Lorain, from Ohio, where it was developed by Dr. Morgan Evans, is the other new one recommended by the Minnesotans. Its leaves stay green six to eight days later than those of either Itasca or commercial timothy and it blooms and matures later. In Minnesota Lorain yields more hay than commercial timothy but less seed. It is being increased by Minnesota seed growers and also is supplied by the Ohio Seed Improvement Association.

—*Successful Farming*

# DDT — Important Weapon in Control of Insects

Condensed from The Cattleman

PUBLICITY given to DDT as an insecticide has created wide interest in its possible uses, and now that limited quantities are available for agricultural and civilian purposes, many inquiries regarding it are being received by the U. S. Department of Agriculture. To help answer inquiries and to avoid confusion as to the results to be expected from its use, the Bureau of Entomology and Plant Quarantine has prepared the following statement:

The knowledge of practical uses of DDT insecticides in agriculture and around the home is still far from complete, even though several million pounds of DDT have already been used by the Army, Navy, and Public Health Service for the control of disease-carrying insects. Most of this was used under the direction of trained personnel employing formulations that had been proved for those specific purposes under various conditions.

The Bureau of Entomology and Plant Quarantine, in cooperation with various state agricultural experiment stations and other agencies, has conducted many and extensive tests with DDT during the past 2½ years. These have included investigations of the possible usefulness of DDT insecticides against many insect pests on a great variety of crops and animals, and in buildings. The results of many of the preliminary small-scale experiments are already available, but the outcome of more extensive tests being conducted this year is still to be determined. Information at hand indicates that for certain purposes and under certain conditions the effective and safe use of DDT by civilians at this time is possible.

DDT is suitable for use as an insecticide only when properly prepared. It is not easy to formulate an insecticidal dust from technical grade DDT. However, many manufacturing concerns are equipped to grind it with talcs, clays, sulfur, or other materials into fine powders that contain DDT in various strengths. Such mixtures will be available for dusting. With the addition of a wetting agent these powders may also be mixed with water for use as sprays. DDT is only very slightly soluble in water, but it can be dissolved in various petro-

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leum oils, xylene, or other solvents for making spray solutions or emulsions.

Only a small quantity of DDT is needed in insecticides, and usually from 1/10 to 10 per cent of it in dusts or sprays is sufficient, depending on the intended use. Many different preparations containing DDT in varying quanities will no doubt become available to civilians through their regular dealers. Presumably in most instances instructions for the use of each product will be provided by the manufacturer.

It is pointed out that insecticides shipped in interstate commerce are subject to the Federal Insecticide Act, which requires that the labels must not be false or misleading and that in some cases they must bear ingredient statements.

Persons desiring to use DDT are cautioned by the Bureau of Entomology and Plant Quarantine that insecticides containing this new material will be suited to some of their needs, but not all of them. The entomologists point out that DDT is not effective against all insects and that against certain insects it is much slower in action than some other poisons now in use, such as pyrethrum or rotenone. However, deposits of the material have been found under some conditions to remain effective as a contact poison against many insects for a much longer time than do those of some other insecticides. The proper formulation to use against each pest, the rate and time of applications, and whether or not DDT can be expected to give more satisfactory and more economical results than other available materials have not yet been worked out for many insects. Care should always be taken to avoid applying larger dosages than required.

Some other important factors should be taken into consideration by those contemplating the use for agricultural purposes of insecticidal preparations involving this new material. DDT is harmful to honeybees and to other beneficial insects, as are a number of other insecticides. Used indiscriminately, DDT may interfere with adequate pollination of important food or seed-crop plants and destroy beneficial insect parasites and predators that ordinarily keep certain injurious pests under control.

DDT is highly toxic to fish and certain other cold-blooded animals, but is much less poisonous to warm-blooded animals. Under certain conditions its use experimentally has resulted in some killing of insect-feeding birds. Studies are being carried on in cooperaton with the Fish and Wildlife Service to secure more

information concerning the effect on wildlife of DDT insecticides applied for agricultural purposes. DDT is poisonous to warm-blooded animals when considerable amounts are eaten. No effective method for removing DDT residues from plants or produce has been worked out.

At this time DDT insecticides cannot be recommended for use on grain, forage, or other crops that are to be used as animal feed because of the possible danger associated with residues. As in the case of lead, arsenic, and fluorine, care should be taken to avoid residues of DDT on fruits and other parts of plants or plant products to be used as human food. In oil solutions or emulsions DDT is readily absorbed through the skin of man and animals. Persons using it in this form are urged to take special precautions to avoid repeated or prolonged exposures to the material in oil solutions.

In general, DDT used experimentally in the form of sprays or dusts has not been especially harmful to most plants, although some injury to squash and other cucurbits has resulted from light applications of the material. Extensive tests are under way to determine any possible injurious effect that DDT residues in soil may have on the growth of various crops. In preliminary tests DDT in soil at the rate of 25 pounds per acre was found to retard the growth of bush beans, lima beans, soybeans, hollyhock, onions, spinach, tomatoes, strawberry plants, and rye, and greater quantities to retard the growth of certain other crops. In most instances, however, it would take several years to accumulate injurious amounts of the chemical in the soil from applications and dosages that would be used normally on crops for control of insect pests. The rate of decomposition in the soil has not yet been determined.

Despite these precautions and the present uncertainties attending its use, the entomologists say that DDT will have an important place in insect control along with other materials already in use. Until more complete information is available, they recommend that persons having DDT insecticides try them on only a portion of a crop until it is certain that they will do the job satisfactorily.

*Control of Household Pests*

Preliminary tests with DDT in oil sprays, water emulsions, water-dispersible powders, and dusts have shown this chemical as having great promise in the field of insects affecting man's habitation, his person, and his livestock against body lice, bedbugs, flies of several species, and mosquitoes.

Although the proper dilutions of DDT are yet to be determined for use against lice affecting livestock, clothes moths, carpet beetles, silverfish, and others, sufficient data have been accumulated to suggest its value for use against these insects.

Conflicting reports have been received on its efficacy against certain species of ants, cockroaches, spiders, and ticks. Against the screwworm, the heel fly or cattle grub, the chigger, and the poultry mite, DDT offers little or no measure of protection.

No doubt, formulas containing a wettable DDT powder will have greatest appeal, because these combinations can be readily mixed with water, have no odor, are harmless when applied to the skin of man or the coats of animals, and present no fire hazard.

*Flies in Houses, Barns and Outbuildings.*—A residue left by a spray containing DDT is probably more effective against houseflies or stableflies than any other treatment. On ceilings and walls of homes and barns where flies rest a deposit of this new insecticide retains its toxicity for several weeks or months. A 5 per cent DDT suspension made of wettable DDT powder and water may be applied as a spray to any surfaces where flies are observed to rest, such as walls, doors, screens, ceilings, cross beams, and lamp cords. Flies enter open doors and windows and rest on the walls and screens, especially at night. When these places have received a residual treatment of DDT, the flies die in 1 to 3 hours.

In preparing the spray, make a paste of wettable DDT powder and water and then add sufficient water to give the desired concentration (2.5 pounds of 50 per cent water-dispersible DDT in 3 gallons of water). Early in the fly season a 5 per cent suspension is desirable. During the late summer or early fall one can use a 2.5 per cent suspension with excellent results for a couple of months or longer.

The use of kerosene solution (7 ounces of technical DDT dissolved in 1 gallon) has also been found very effective for this purpose, but when used at this dosage it may become a fire hazard.

It is important to use a coarse or wet spray so that as much of the material as possible will remain on the surface treated. When the water or oil evaporates, the DDT remains and acts as a residual insecticide that kills flies and other insects by contact. A knapsack sprayer or a power sprayer with nozzles adjusted for large droplets is recommended. In small rooms a hand sprayer can be used. The dosage should be about 1 quart of spray to 250 square feet of surface. The water

spray will leave a light visible residue on the sprayed surface, which might be objectionable in homes.

Oil sprays should not be used on animals, and they are not recommended for general use on buildings. They offer an opportunity for DDT to be absorbed by the skin, and on buildings they increase the possibilities of a fire. Because they penetrate porous surfaces such as concrete, brick, or soft wood, oils are capable of transporting DDT into the walls, where much of it is not accessible to the flies and other insects. On the other hand, water sprays made of wettable DDT powder remain on the surface, where the treatments afford full advantage for killing insects.

*Bedbugs.*—DDT is the perfect answer to the bedbug problem. When properly applied as a 5 per cent spray or as a 10 per cent powder to mattresses, beds, and chicken houses, these places will remain free of bedbugs for 6 months or more. Wettable DDT powder may be used in water as a spray. When a 5 per cent DDT solution (7 ounces of technical grade DDT in 1 gallon of kerosene) is used about 3 liquid ounces is needed to each full-size bed. This is enough material for a thorough and careful treatment of the mattress, pillows, springs, and joints in the bedframe. The spray should be forced into each joint of the bed and both sides of the mattress should be lightly treated. After a few hours of drying the bed may be made and used without fear of injury to the occupant. One and one-half ounces of 10 per cent DDT powder is sufficient for treatment of a full-size bed. It is applied to the same locations as recommended for the spray. It is not necessary to treat walls, because the bedbugs must come to the bed for meals of blood and are killed when they come in contact with the residue of DDT on the bed.

It is advisable to wear masks when applying the spray to avoid irritation due to kerosene or to excessive inhalation of DDT. The risk is not great. Some ventilation is necessary during treatment and, of course, one must be careful not to use an oil spray near a fire. Gasoline must never be used.

*Brown Dog Ticks.*—DDT may be applied as a 10 per cent dust (1 pound of technical grade DDT milled with 9 pounds of pyrophyllite, talc, or powdered soapstone) to the cracks and crevices about baseboards and to floor coverings infested with brown dog ticks. Ticks filled with blood remain in their hiding places and are not easily killed by the treatments. When they shed their skins and when the eggs hatch

and the ticks are ready for a meal of blood, they are very susceptible to DDT and will be killed upon crossing a treated baseboard or rug.

This species of tick is the only one that is found in large numbers within homes. It attaches only to dogs and carries no disease—at least to humans. The dust kills the ticks slowly; hence it should not be cleaned from fabrics, floors, and other surfaces for about 2 weeks. After that time the powder can be taken up with a vacuum cleaner and a second treatment made later if necessary.

This powder may be dusted on dogs, about one-fourth teaspoonful being sufficient for the entire body of an average-sized animal. Cats should not be treated with DDT dusts, because they lick themselves and can ingest enough of the poison to make them sick.

A 5 per cent DDT-kerosene spray (7 ounces of technical grade DDT in 1 gallon of kerosene) is also effective against the brown dog tick when applied to walls, floors, the lower side of rugs and in other places where this tick hides. Oil sprays must not be used on animals, and should not be used where there is any chance of causing a fire in a building.

*Other Pests in Houses.*—A 5 per cent DDT spray may be made by dissolving 7 ounces of technical DDT in 1 gallon of kerosene. A wettable powder may be dissolved in water for a 5 per cent DDT spray, but this will show on furniture and walls and should not be used inside the home. It can be used on whitewashed walls, about kennels, in poultry houses, and in barns. A 10 per cent DDT powder can be applied to cracks and crevices of the house and the surplus material wiped from the floor with a cloth.

For mosquities a 5 per cent DDT solution can be sprayed on the walls, ceilings, and screens in the same manner as against flies, with excellent results. Mosquitoes landing on treated surfaces will eventually die. Malaria mosquities can in this manner be prevented from biting twice; hence the treatment offers a good control of malaria and other mosquito-borne diseases.

The annoyance from sand flies in homes can be reduced by treating screens with a 5 per cent DDT oil spray. The screens and wall or ceiling surfaces near lights may be sprayed or treated with a cloth. This treatment should remain effective for several weeks.

For cockroaches a 10 per cent DDT powder is about as good as sodium fluoride for treating their hiding places. It lasts longer than sodium fluoride, but as in the

case of that material, about one week elapses before there is a marked reduction in the number of roaches present. A 5 per cent spray containing DDT may be used as a supplementary treatment on the under side of table tops, drawers, refrigerators, and shelving.

*For fleas* in houses 10 per cent DDT powder may be applied to the sleeping places of dogs and cats and in holes and runways used by rats. It may be used beneath rugs, on floors, and even on soil that is visited by flea-infested animals. One-half pound will treat 1,000 square feet. One may also use a 5 per cent DDT-kerosene spray on similar places as well as to the top surface of rugs. Use one quart to 250 square feet and apply as a coarse spray, for fine sprays will drift to the walls where they are ineffective against fleas.

*For ants* in buildings apply a 5 per cent DDT-kerosene spray behind and beneath baseboards, behind window sills and frames, about sinks in the kitchen and bathroom, to all table legs and chair legs, to both sides of pantry shelves, and to any cracks and crevices leading to the outside of the building. Not all species of ants will respond to the treatment, but many of them can be controlled for several weeks with a single application of the spray.

*Uses against insect pests of forest and shade trees and forest products.*

The general uses of DDT over extensive forested areas cannot be recommended until the possible detrimental effects to beneficial insects, fish, and wildlife have been determined. Experiments indicate that, provided there is no serious hazard to such life, preparations containing DDT will be far more efficient against many forest insects than the insecticides now in common use.

DDT should not be applied to extensive forest areas at rates in excess of one pound per acre. This low rate is not practical except by the use of airplanes or other special equipment. Because of the hazards to fish, beneficial insects, and wildlife, such applications should be made only by or under the direction of experienced entomologists who are familiar with these hazards.

DDT has been found effective against such insects as tip moths, the white pine weevil, and the locust borer, but more information is needed before it can be recommended for their control. It has proved effective against some aphids, but in general the results against these insects have not been nearly so satisfactory as when nicotine or other standard materials were used.

The recommendations given

below can be made at this time. Although commercial preparations are available for these purposes, a typical formula for use against forest and shade tree insects is suggested as follows:

One pound of technical grade DDT dissolved in one quart of solvent such as xylene, to which is added 1 to 1½ ounces of an emulsifying agent. For a 0.1 per cent DDT emulsion add 100 gallons of water.

Defoliating Insects—In limited applications emulsions containing DDT may be used to protect shade trees and ornamentals against many defoliating insects, including the locust leaf miner, boxwood leaf miner, cankerworms, gypsy moths, sawflies, elm leaf beetles, the catalpa sphinx, evergreen bagworm, mimosa webworm, and others. For the tent caterpillar it is only necessary to apply the spray to the branches of wild cherry and other host trees a few days before the eggs hatch, or to spray the nests very lightly as they form. For cankerworms, where the female crawls up the tree for oviposition, and for the gypsy moth, where the young crawl up the trunk of the tree, good control can be obtained merely by spraying the stem of the tree for a few feet above the ground. This method of treatment may be useful when power equipment is not available to reach the tops of tall trees. Emulsions are recommended for use against defoliating insects in strengths of ½ to 1 pound of DDT per 100 gallons of water. DDT is not harmful to forest and shade trees, but many of the emulsifying agents burn the foliage and care must be exercised. Emulsions can be applied by means of the ordinary hand knapsack sprayers or by power sprayers; the surfaces should be wetted until the material begins to drip from the foliage.

*Insects Attacking Logs and Woodwork of Buildings*—DDT can be used very effectively against this type of insects. For carpenter ants spray floors, baseboards, porches, and other places where the ants are seen crawling with 1 to 5 per cent of DDT in kerosene or other light oil, taking precautions not to use the oil spray near a fire. For freshly cut logs, to prevent attack by Ambrosia beetles and wood borers, spray the bark surface very thoroughly with a 5 percent of DDT solution, wetting it down so that no portions are left untreated. For termites 5 percent of DDT in kerosene solution or in emulsion can be used as a soil poison in the same manner as recommended for other materials. Thus used, DDT has been found to be effective as a soil poison for more than two seasons, although it is gener-

illy considered necessary to test soil poisons for a period of 5 years to determine with a reasonable degree of certainty their practical effectiveness.

Sucking Insects — DDT has been found very effective against leaf hoppers, tree hoppers, and spittle bugs on shade trees and ornamentals. For this purpose sprays that contain DDT in strengths of 1/10 to ½ of 1 percent may be used.

*Use Against Fruit Insects*

DDT has shown promise for the control of such important fruit-insect pests as the codling moth, apple leafhoppers, oriental fruit moth, grape berry moth, grape leafhoppers, rose chafer, Japanese beetle, little fire ant on citrus in Florida, sucking bugs that cause distortion of peaches, and, in preliminary small-scale tests, some others. It does not appear promising in the control of the plum curculio, orchard mites, or pear psylla, and its value for the control of scale insects and aphids, or plant lice, that infest various kinds of fruits is questionable. For the control of fruit insects it has, in general, been most satisfactory when used in the form of a water-dispersible powder at the rate of ½ to 1 pound (more often 1 pound) per 100 gallons of spray. It can be used in combination with most of the common insecticides, such as lead arsenate, crysolite, and nicotine preparations, with fungicides such as various forms of sulfur and bordeaux mixture, and with oil. For the control of the little fire ant in citrus groves, the best results have been obtained by spraying the trunks and larger branches of trees with emulsified fuel-oil solutions containing 4 to 8 ounces of DDT and 2 to 4 quarts of fuel oil per 100 gallons of final spray mixture.

Detailed recommendations for the use of DDT to control fruit insects are not given here, as for the most part there will be little reason for such use during the remainder of the 1945 season, and more detailed and reliable recommendations can be made when the results of experimental work now under way become available.

DDT in dust and spray form and as an aerosol will kill a number of common insect pests of vegetables. It has shown little or no effect against others, including the Mexican bean beetle, the tobacco hornworm, the turnip aphid, the melon aphid, the cabbage seedpod weevil, the red spider mite, and the tomato russet mite. Tests conducted to date have shown that most of the common vegetable plants are not adversely affected by low strengths of DDT applied in dust or aerosol form. However, some injury to squash, pumpkins, melons, and other cu-

curbits may be expected even when this material is applied at strengths and dosages that do not affect other types of vegetables.

It appears probable that DDT in proper formulations will serve as an excellent remedy for several common potato pests, such as the Colorado potato beetle, the potato leafhopper, the potato flea beetle, the potato psyllid, and possibly aphids that affect potatoes, as well as the tomato fruitworm, the pea weevil, and the pea aphid. When available in aerosol form, DDT should provide a convenient and effective method for controlling many of the pests found in greenhouses.

*Uses Against Vegetable Insects*

The following recommendations for the use of DDT in the control of vegetable insects can be made at this time:

Cabbage Caterpillars — DDT will control all species of caterpillars that commonly attack cabbage in the southern producing areas. A dust mixture containing 2 percent of DDT in pyrophyllite, talc, clay, or sulfur, used at the rate of 20 pounds per acre and applied at intervals of 10 days to 2 weeks, is recommended. The first application should be made as soon as the caterpillars appear on the plants. As DDT is poisonous, its use throughout the growing crop period is attended by a residue hazard. Therefore, applications of this material should not be made to the crop at the time that any part of the plant which is to be marketed or used as food is exposed. In the case of the early Jersey-Wakefield variety of cabbage, which is marketed with four loose leaves, the danger period is about 30 days before the head is ready for the market. The recommendation is that treatments not be made after the center leaves of the cabbage plant cease to unfold and begin to form in a small compact head. If this application limit is observed, stripping the outside leaves from the cabbage before it is marketed should remove all danger of harmful residues. Although there are some indications that the cabbage aphid is more numerous following applications of DDT to cabbage, it is questionable whether these aphid population build-ups are any greater than when arsenicals have been applied.

*Cereal and Forage Crops*

DDT has not been found effective for the control of the sugarcane borer, and populations of the yellow sugarcane aphid in sugarcane plots treated with DDT have greatly increased. In a single test a 5-percent dust mixture applied at a high rate to soil infested with white grubs had no effect on the grubs.

When used experimentally, DDT has been found promising

for the control of many insects attacking cereal and forage crops in the field and in storage. These include grasshoppers on alfalfa and other vegetation, chinch bugs on corn, Lygus bugs on seed alfalfa, the vetch weevil as a pest of hairy vetch seed, the alfalfa weevil, and the velvetbean caterpillar on peanuts and soybeans. Its use has reduced infestations of the European corn borer in sweet corn, and dusts and sprays have been highly effective as both stomach and contact poisons against adults of the white-fringed beetle. When mixed into the top soil DDT also killed a large percentage of white-fringed beetle larvae. It is one of the most efficient materials yet tested for treatment of paper or fabric bags and cardboard cartons to prevent entrance of insects that attack cereal products. DDT was also found effective for the control of the potato leafhopper on alfalfa and peanuts, the tobacco thrips on peanuts, the corn flea beetle, the rice stinkbug, the lespedeza webworm, and the corn earworm in sweet and seed corn.

Recommendations for the use of DDT against these insects cannot be made at this time owing to the need for further information on poisoning hazards of residues; on the effect of foliage and soil applications on growing plants and beneficial insects; on best formulations, dosages, and application schedules; and as to results when used under conditions different from those prevailing in experiments to date. The only uses in this field recommended at this time follow:

Treatment of Stored Seed—DDT has been found extremely effective against most of the common pests of stored seed, and its use for that purpose is recommended. It is best used in combination with a carrier dust, to give it greater volume and insure a better distribution over the seed. If thoroughly mixed with the seed, 1 ounce of a dust containing 3 percent of DDT in pyrophyllite or other carrier dust is sufficient for treatment of 100 pounds of seed. A very effective combination is obtained by using magnesium oxide as the carrier dust. DDT alone does not repel insects, but magnesium oxide does. Neither product has any adverse effect on germination, regardless of the moisture content of the seed. For treating seed in bulk the use of a seed-treating machine will be found most effective.

Because of the poison hazard, the use of DDT is not recommended on stored grains or cereal products that are to be used for food by humans or animals.

*Treatment of Grain Bins, Warehouses, and Mills*—Sprays

containing 5 percent or less of DDT dissolved in refined deodorized kerosene or in water suspension or emulsion have been found very effective and are recommended for use on walls and woodwork of warehouses, flour mills, and empty grain bins. The weevils and other insect pests of stored grain and cereal products crawling on or burrowing into walls or woodwork are killed as they come in contact with the DDT residues. Enough spray is used to cover the surfaces without run-off, but the quantity applied should not exceed 1 gallon per 1,000 square feet. Care must be taken to avoid contamination of grains and food products when applying the sprays, and precautions to avoid fire are essential if the oil spray is used.

*Control of Cotton Insects*

The value of the DDT insecticides for control of insects attacking cotton has not been fully determined. The recommendations given below are only tentative and are for the benefit of growers who wish to test DDT against cotton insects. Preliminary experiments indicate that DDT is not so effective as calcium arsenate against the boll weevil, that it does not control the cotton leafworm, and that its use may result in an increase of cotton aphids and red spiders. It is apparently more effective against the cotton fleahopper and several other mirids, plant bugs, stinkbugs, and the bollworm than the insecticides generally used for their control. Encouraging results also have been obtained against the pink bollworm, thrips, and the beet army-worm on cotton.

Most of the tests against cotton insects have been with DDT dust mixtures, as dusting has been more economical and practical than spraying for cotton in the past. The recent development by the Bureau of equipment for aerial and ground spraying that will cover an area with 2 or 3 gallons of finely atomized concentrated solutions or emulsions may prove to be an effective method of applying DDT. Before this method is recommended, additional tests are needed to develop spray formulations that will not injure cotton plants. Tests have shown that DDT in pyrophyllite added to calcium arsenate apparently causes more aphids to develop than when without the arsenical.

Applications of dusts containing from 2 to 10 percent DDT mixed with sulfur appear to be more effective against the sucking insects on cotton than mixtures containing only pyrophyllite or other inert diluents. In the control of the cotton flea hopper a dust of 5 percent DDT-95 percent sulfur, or 5 percent DDT-45 percent

pyrophyllite - 50 percent sulfur, gave a higher kill in a shorter time and remained effective for a longer period than sulfur or the sulfur - arsenical mixtures now used. From two to three applications of 12 to 15 pounds per acre with ground machines at 10-day intervals have given excellent control in experimental plats and fields of cotton with medium to heavy infestations of flea hoppers.

Tests in Arizona for control of the group of sucking insects on irrigated cotton commonly referred to as Lygus bugs and stinkbugs indicated that a dust of 5 percent DDT-45 percent pyrophyllite-50 percent sulfur applied at the rate of 20 pounds per acre is superior to the paris green-sulfur mixtures. Better control was obtained of the plant bugs than of the stinkbugs. Owing to continuous movement of these insects onto cotton, several applications at weekly intervals are needed for control.

For bollworms on cotton a DDT dust mixture may be substituted for calcium arsenate, lead arsenate, cryolite, or basic copper arsenate, and is more effective against the large worms than other insecticides. However, for better control of the bollworms, dusting should begin just as the eggs are hatching, in order to kill the worms before they enter the squares or bolls. It appears that 12 to 16 pounds per acre of a 5- to 10-percent DDT dust with an inert carrier or a mixture of an inert carrier and sulfur will be the most practical dust for bollworms. Two or three applications at 5-day intervals will control a brood of bollworms, but as there may be other egg-laying moths moving into the fields, several applications may be needed for protection. Applications of insecticides by ground machines seem to give better coverage to the tips of the plants and better bollworm control than airplane applications.

# Don't Sentence Your Boar to a Concentration Camp

**Condensed from American Hampshire Herdsman**

*Dick Hollstein*

THE lack of care of the herdsire is one of the most common and costly practices in the hog business. Surely few have ever given it any consideration or this would not be so generally true. The value of a good herdsire is not denied by anyone, but it is difficult in too many instances to reconcile this fact with the actual treatment he ordinarily receives.

In observing the various methods of mishandling, one somehow gets the impression that the boar has been convicted and condemned to spend the rest of his life under conditions that would stamp medieval punishment as puny in comparison. Of course, there are exceptions. There are no hard and fast rules that can be laid down for the care of a herdsire. Just hard common sense if applied will dictate the proper course to follow. The boar needs pleasant, quiet surroundings, proper feed, exercise, good housing and proper handling. That is simple enough.

Many would say that they are observing these essential methods; but let's look and see some of the ways in which they are being applied. The feed may consist of an ear of corn and some filthy water, which might even be frozen into a block of ice. Or he may get a trough of stale slop which might be several days old. Exercise is limited to the distance from the quarters to the breeding pen or ranting around the confines of his inadequate pen.

Housing probably consists of a dark stall in a barn, or a panel off in a corner of some drafty shed, or perhaps a half-wrecked individual hog house with a 2 by 4 pen in front, a mass of mud in rainy weather or frozen into cobblestone surface on colder days. This is oftentimes located next to the hog lot in which the sows run or even within the lot for convenience at breeding time.

Top this off with the club method of discipline with the idea that he must be controlled by fear of his attendant—and you have the answer to a very large percentage of breeding failures.

These are, of course, extreme cases but apply in varying degrees to an astonishing number of herds.

Many things enter into the care and handling of the herdsire for best results. To lay down a blanket rule that would answer all the questions on this would be impossible except in a general way. Every wise herdsman knows that each animal presents a different problem since each varies in disposition and temperament. Observation and understanding overcome many of the difficulties that might arise through the lack of them. On farms where these are practiced the results are invariably reflected in the condition and breeding ability of the sire.

The ideal condition and the one most conducive to satisfactory results is where the boar can be used heavily and at the same time hold his weight and actually gain a little if properly handled. Of course, a boar can be in too high a condition which will tend to make him less active. This, however, can be easily remedied by sufficient exercise and manipulation of the feed supply. It is a common fallacy among a lot of breeders of swine that a boar must lose a considerable amount of weight during the breeding season.

I know it is difficult to achieve the ideal condition with every animal, but with good herdsire management it can be accomplished to a large extent.

To me there are three important things that are necessary in getting and maintaining that ideal condition that is so desired. Sufficient exercise, a well balanced ration and the use of tact and common sense in handling of the boar are necessary in the care of the herdsire.

Sufficient exercise is most generally neglected. The boar should have permanent quarters, with ample room for exercise and green pasture when possible. Quite often a boar is moved from his regular lot to a more convenient place at breeding time. This may or may not be of importance but it certainly has every reason to upset the animal since they are very much creatures of habit. Some herdsmen bring the sow to the boar's pen and others use a regular breeding pen to which both the sow and the boar are brought. Either way is quite satisfactory and the routine is quickly learned by the boar. The boar lot should be a considerable distance from the sow quarters and he should have a comfortable, well ventilated house, with a door high enough for him to pass in and out without striking his back. It's surprising how few hog houses have doors high enough.

I've remodeled many of them myself and there are plenty more that need it. Plenty of dry bedding is very important and should be changed regularly. I've found it very satisfactory to keep a young boar with an older one. It's company for the older boar and tends to keep the younger from ranting. Almost invariably they become great pals.

Well balanced feed should be provided and this only in a necessary amount for desired results. Overfeeding is the quickest way to throw the boar off feed. If he will come at feeding time and clean up his trough, there will be no reason to worry over his holding up in condition.

Of probably as great importance as anything else is the handling of the boar. He is easily trained and the first step is to acquire his confidence. He soon learns when he has nothing to fear from his handler, and having learned this his obedience is assured. It is easy to detect the boar that has been whipped into submission. He is always on the defensive and during breeding time is a decidedly dangerous customer. Everyone with experience knows that breeding time is attended with many difficulties and to get maximum service from the boar everything must work smoothly. I have known boars that refused to work in a crate because of abuse and rough treatment from the attendant. I also know just how much of a strain it is at this time upon a herdsman's patience as well as how important is the restraint of an overwrought temper.

In summing it all up, it is the careful attention to the small details and the instinctive knowledge of what to do at the proper time that means success or failure. It is something that is not learned from books. May I repeat, the herdsire is a valuable investment regardless of his cash cost. Since he is kept solely for the service he can render, it is the obvious duty of his owner to see that he has every possible chance to perform that service.

## BOOKS OF INTEREST

**PLEASANT VALLEY**—By Louis Bromfield, farmer, soil conservationist, author.

This appealing and delightful book is written for everyone—city-dweller or country man. It is an engaging account of the author's experiences as a farmer in his native Ohio, telling the story of the land and people who are closest to him.

Publishers: Harper & Brothers. 302 pages; 49 drawings by Kate Lord. $3.00.

**PALESTINE—LAND OF PROMISE**—By Walter Clay Lowdermilk, soil conservationist, forestry engineer, assistant chief of the Soil Conservation Service.

Out of Palestine there is emerging a "new realization of man's moral obligation to the good earth which nourishes those who give it loving care." In the book, **"Palestine—Land of Promise,"** the author presents the achievements of Jewish settlers in that eroded, sterile land where through the application of modern methods of irrigation, drainage, fertilization and reforestation amazing changes are being wrought.

Publishers: Harper & Brothers. 236 pages. $2.50.

**FARMERS OF THE WORLD—The Development of Agricultural Extension,** edited by Edmund deS. Brunner, Irwin T. Sanders, and Douglas Ensminger.

With war-torn countries beginning the rehabilitation of their rural areas, this book is particularly important, mobilizing the findings of science in this field and showing the way to present them to farm people with sympathetic interpretation and assistance in their application.

Publishers: Columbia University Press. 208 pages. $2.50.

**PAY DIRT—Farming and Gardening With Composts,** by J. I. Rodale.

This book describes the revolution in agriculture in many countries of the world and emphasizes the close relation between a fertile soil and human health. It challenges the chemicalized farming of past decades and its results in erosion, soil exhaustion, plant and animal disease, and the malnutrition of people.

Publishers: The Devin-Adair Co. 242 pages. $3.00.



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## FOR THE FARMER'S LIBRARY

**These books are recommended as outstanding in their field:**

**A Living from Bees** — By Frank C. Pellett, Field Editor of American Bee Journal. Orange Judd Publishing Co., Inc. $2.00.

**America's Garden Book** — By Louise Bush-Brown and James Bush-Brown. Charles Scribner's Sons. $3.50.

**An Agricultural Testament**—By Sir Albert Howard, C.I.E., M.A., former Director, Institute of Plant Industry, Indore. Oxford Univ. Press. $3.50.

**Animal Sanitation and Disease Control**—By Dr. R. R. Dykstra, Dean of the School of Veterinary Medicine, Kansas State College. The Interstate Printers and Publishers. $2.85.

**Beef Cattle** — By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Sons, Inc. $4.00.

**Beef Cattle Production in the South**—By D. W. Williams, Head, Department of Animal Husbandry, A. & M. College of Texas, College Station, Texas. The Interstate Printers & Publishers. $2.00.

**Breeds of Livestock in America**—By Henry W. Vaughan, formerly Prof. of Animal Husbandry, Iowa State College. College Book Co. $3.75.

**Dairy Cattle Feeding and Management**—3rd Edition—By H. O. Henderson, Prof. of Dairy Husbandry, W. Va. Univ., Carl W. Larson and Fred S. Putney. John Wiley & Sons, Inc. $4.00

**Dairy Science**—By W. E. Petersen. Ph.D., Assoc. Prof. Dairy Husbandry, Univ. of Minn. By R. W. Gregory. J. B. Lippincott Co . $4.00.

**Diseases and Parasites of Poultry** — By Edgar Hugh Barger, D.V.M., Berkeley, Calif., and L. E. Card, Ph.D., Prof. of Poultry Husbandry, Univ. of Illinois. Lea & Febiger. 3rd Edition (1943). $3.75.

**Feeds and Feeding**—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.

**Farm Management**—By Robert R. Hudelson. The Macmillan Co. $2.00.

**Farm Management and Marketing** — By V. B. Hart, M. C. Bond, L. C. Cunningham, all of N. Y. State College of Agriculture, Cornell University. Publishers: John Wiley & Sons, Inc. $2.75.

**Judging Dairy Cattle**—By Edwin S. Harrison, Professor of Animal Husbandry, Cornell University. John Wiley and Sons, Inc. $2.75.

**Livestock Production**—By Walter H. Peters, Chief, Div. of Animal and Poultry Husbandry, Univ. of Minn. McGraw-Hill Book Co., Inc. $3.50.

**Livestock Judging Handbook** — By Julius E. Nordby and W. Malcoln Beeson, Ph.D., Asst. Professors Animal Husb., Univ. Idaho. The Interstate Printers. $2.60.

**Natural Principles of Land Use**—By Edward H. Graham,, Chief of the Biology Division of the Soil Conservation Service. Oxford University Press. 275 pages. $3.50.

**Poultry**—By A. R. Winter, Asst. Prof. Poultry Husbandry, Ohio State Univ., and E. M. Funk, Asst. Prof. Poultry Husbandry, Mo. State Univ. J. B. Lippincott Co. $5.00.

**Practical Farming for the South** — By Benjamin F. Bullock, now Prof. Rural Education, Atlanta Univ. Univ. of North Carolina Press. $2.50

**Profitable Poultry Keeping**—By H. Clyde Knandel, Head, Dept. Poultry Husb., Penn State College. Orange Judd Publishing Co., Inc. $3.00.

**Pork Production**—By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. The Macmillan Co. $3.75.

**Repairing Farm Machinery**—By Ivan G. Morrison, Asst. Professor Agri. Education, Purdue Univ. The Interstate Printers & Publishers. $1.80.

**The American Land—Its History and Its Uses** — By William R. Van Dersal, biologist in the U. S. D. A. Oxford University Press. $3.75.

**Successful Poultry Management**—By Morley A. Jull, Professor and Head of Poultry Dept., Univ. of Maryland. McGraw-Hill Book Co., Inc. $3.00.

**Sheep Production**—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Ag. Univ. Ky. McGraw-Hill Book Co., Inc. $4.00.

**Soil Conservation** — By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Dept. of Agric. McGraw-Hill Book Co., Inc. $6.00.

**The Farm Primer**—By Walter Magnes Teller, formerly with the Farm Security Administration, U. S. D. A. David McKay Co. $2.50.

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